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WRITTEN TEST FOR THE POST OF TECHNICAL ASSISTANT (INSTRUMENTS) –A

Roll No.

Date: 05.08.2023

Duration: 90 Minutes

Time: 11 AM

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATE

1. Write your Roll Number on the top of the Question Booklet and in the OMR sheet.
2. Each question carries 1 mark.
3. There will be no negative marking.
4. Each question carries 4 options. Darken completely the bubble corresponding to the most appropriate answer using blue or black ball point pen.
5. Marking more than one answer will invalidate the answer.
6. Candidate should sign in the Question paper and OMR sheet.
7. Candidate should hand over the question paper and OMR sheet to the invigilator before leaving the examination hall.

Signature of the Candidate

Ofc

[Handwritten signature]

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QUESTION PAPER

1. Process of conversion of imine to enamine is known as -----
a) Imination (b) Amination (c) Enamination d) Tautomerism

2. Sintering is conventionally performed at _____
(a) At room temperature (b) Above boiling point
(c) Below melting point (d) At cryogenic temperature

3. Missing of one cation and one anion in an ionic crystal (having charge neutrality) is called
(a) Frenkel Defect (b) Schottky Defect
(c) Electronic imperfections. (d) Compositional imperfections

4. If P is the number of phases, F is the degrees of freedom, and C is the number of components in a system, then, according to phase rule
(a) $P + F = C - 2$ (b) $P + C = F - 2$
(c) $P + F = C + 2$ (d) $P + C = F + 2$

5. The correct order of the co-ordination number in simple cubic, body centered cubic and face centered cubic of unit cell is
(a) 6, 8, 12. (b) 12, 8, 6.
(c) 8, 8, 12. (d) 6, 8, 8.

6. Which of the following is false?
(a) Notch is a sudden change in section of a material
(b) Stress concentration is produced due to notches
(c) Notches change the stress applied to the body
(d) Smaller the tip of the notch, less the increase in stress

7. Which of the following decreases transition temperature in steel?
(a) Carbon (b) Nitrogen
(c) Phosphorous (d) Manganese

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QUESTION PAPER

8. Non-destructive testing is used to determine

- (a) Location of defects (b) Chemical composition
(c) Corrosion of metal (d) All of these

9. Identify the type of destructive testing

- (a) Radiographic test (b) Dye penetrant test
(c) Creep test (d) All of the above

10. The percentage of phosphorus in phosphor bronze is

- (a) 1 (b) 2
(c) 11.1 (d) 98

11. Babbit metal is a

- (a) lead-base alloy (b) copper-base alloy
(c) tin-base alloy (d) cadmium-base alloy

12. Which of the following material has nearly zero coefficient of expansion?

- (a) Stainless steel (b) High speed steel
(c) Invar (d) Heat resisting steel

13. Which of the following corrosions are caused due to velocity of fluid flow in pipes?

- (a) Bimetal corrosion (b) Cavitation corrosion
(c) Galvanic corrosion (d) Intergranular corrosion

14. The ability of a material to absorb energy in the plastic range is called

- (a) resilience (b) creep
(c) fatigue strength (d) toughness

15. Machinability of a metal depends on

- (a) Hardness (b) Tensile strength



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QUESTION PAPER

- (c) Brittleness (d) Both hardness and tensile strength
16. The property of a material necessary for forgings, in stamping images on coins and in ornamental work, is
- (a) elasticity (b) plasticity
(c) ductility (d) malleability
17. In normalizing, one of the following is not correct:
- (a) it relieves internal stresses (b) it produces a uniform structure.
(c) the rate of cooling is rapid (d) the rate of cooling is slow.
18. Which of the following materials is used for making permanent magnet.
- (a) Cobalt Steel (c) Alnico
(b) Carbon Steel (d) All of the above
19. Which one of the following is not the purpose of full annealing
- (a) refines grains (b) Improves hardness
(c) removes strains and stresses (d) induces softness.
20. Binary phase diagrams of two component systems are usually
- (a) two dimensional plots of temperature and pressure.
(b) two dimensional plots of temperature and composition.
(c) two dimensional plots of pressure and composition.
(d) two dimensional plots of pressure, temperature and composition.
21. Imperfection arising due to the displacement of an ion from a regular site to an interstitial site maintaining overall electrical neutrality of the ionic crystal is called
- (a) Frenkel imperfection (b) Schottky imperfection
(c) Point imperfection (d) Volume imperfection

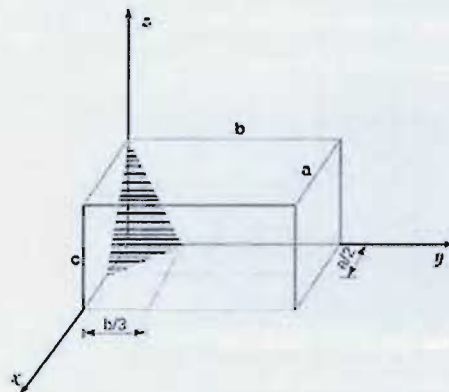
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QUESTION PAPER

22. Which of the following is not true for crystallographic axes?

- (a) They must be parallel to the edges of the unit cell
- (b) They must be perpendicular to each other
- (c) They must originate at one of the vertices of the cell
- (d) They form a right-handed co-ordinate system

23. Miller indices of the hatched plane in the following figure are:



- (a) (2 3 1)
- (b) (3 2 1)
- (c) (3 2 0)
- (d) (1 1 1)

24. Hall effect can be used to measure

- (a) Mobility of semiconductors
- (b) Conductivity of semiconductors
- (c) Resistivity of semiconductors
- (d) All of these

25. Pure silicon at zero K is an

- (a) Intrinsic semiconductor
- (b) Extrinsic semiconductor
- (c) Metal
- (d) Insulator

26. Insulating material used in a spark plug is

- (a) Rubber
- (b) Porcelain
- (c) Mica
- (d) Polystyrene

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27. For better fluidity of the molten metal, the following is added in blast furnace

- (a) Chlorine
- (b) Carbon
- (c) Manganese
- (d) Sulphur

28. Induction hardening is the process of

- (a) Electrical hardening process
- (b) Hardening the surface
- (c) Hardening the core
- (d) Uniform hardening

29. Steel balls for ball bearings are generally made of

- (a) Carbon chrome steel
- (b) Stainless steel
- (c) Cast steel
- (d) Nodular cast iron

X 30. The process of zinc coating used extensively for protecting steel from atmospheric deterioration is known as

- (a) Anodizing
- (b) Colourizing
- (c) Phosphatizing
- (c) Galvanizing

31. The defect blow hole in castings is caused due to

- (a) Low Permeability of the sand
- (b) Excessive moisture
- (c) Improper venting
- (d) Any of the above

32. According to Hume Rothery's rules, size of atoms must not differ by more than _____

- (a) 5%
- (b) 15%
- (c) 35%
- (d) 55%

33. Bravais lattice consists of _____ space lattices.

- (a) Eleven
- (b) Twelve
- (c) Thirteen
- (d) Fourteen

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QUESTION PAPER

34. The interaxial angles of a hexagonal crystal system are given by _____

- (a) $\alpha = \beta = \gamma = 90^\circ$ (b) $\alpha = \beta = 90^\circ \gamma = 120^\circ$
(c) $\alpha = \beta = \gamma \neq 90^\circ$ (d) $\alpha \neq \beta \neq \gamma \neq 90^\circ$

35. Natural Rubber is _____

- (a) Cis-1-4-Polyisoprene (b) Trans-1-4-Polyisoprene
(c) Cis-1-3-Isoprene (d) Trans-1-3-Isoprene

36. Aqua-regia is a mixture of HCl & HNO₃ in the ratio of

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

37. One of the following cannot be extracted using carbon

- (a) Zinc (b) Aluminium
(c) Copper (d) Iron

38. Glass which contains cerium oxide as one of its constituents

- (a) Crooke's glass (b) Pyrex glass
(c) Crown Glass (d) Flint Glass

39. Acheson process produces

- (a) Silica (b) Coke
(c) Silicon Carbide (d) Boron Carbide

40. Among the following forms of carbon, the thermodynamically stable one is

- (a) Carbon nanotube (b) Fullerene
(c) Diamond (d) Graphite

41. Which among them is not a precipitating reagent?

- (a) Dimethyl glyoxime (DMG) (b) Cupferron
(c) Calcon (d) 8-hydroxy quinoline



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42. what is called ammonium salt of purpuric acid?

- (a) Solochrome black T (b) murexide
(c) Solochrome dark blue (d) EDTA

43. Which among the analytical technique in which the difference in energy inputs to a substance and a reference material is measured as a function of temperature when subjected to a controlled temperature range?

- (a) Differential scanning calorimetry (b) Differential thermal analysis
(c) Thermogravimetry (d) Redox titration

44. which among them is an oxidation- reduction indicator?

- (a) Diphenyl amine (b) methyl orange
(c) phenolphthalein (d) Eriochrome black T

45. Adsorption indicators are either acid dye or basic dye. Which of them is not an adsorption indicator?

- (a) Eosin (b) Rhodamine
(c) Fluorescein (d) ferroin

46. what are the factors which does not affect the result of Thermogravimetric analysis?

- (a) heating rate (b) crucible geometry
(c) dissolved oxygen (d) furnace atmosphere

47. Which among the methods is not suitable for the determination of blood sugar?

- (a) Drabkin's method (b) Glucose oxidase- peroxidase method
(c) Hexokinase method (d) Nelson- Somogyi's method

48. Which among the following is not a method of preparation of fullerenes?

- (a) Laser ablation method (b) Benzene combustion method
(c) Arc-discharge method (d) Chemical vapour deposition

49. Which among the following is the method of analysis of aspirin tablet?

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- (a) Thin layer chromatography (b) titrimetric method
(c) UV spectrometry (d) Ferric chloride test

50. What is the chemical formula of paracetamol?

- (a) 2-[4-isobutylphenyl]propionic acid (b) N-[4-hydroxyphenyl]ethanamide
(c) Acetyl salicylic acid (d) Acetaminophen

51. 2.5 g of an iron compound on suitable treatment yield 0.391g of iron(III) oxide. Percentage of iron in the compound is

- (a) 10.94
(b) 11.32
(c) 7.99
(d) 9.87

52. For a zero order reaction, value of slope of time vs [A] with concentration as an independent variable is.

- (a) K
(b) 2K
(c) 1/K
(d) K/2

53. Number of antibonding electrons in NO and CO according to molecular orbital theory is

- (a) 1,1
(b) 1,2
(c) 1,0
(d) 2,1

54. A metallic element crystallizes into a lattice containing sequence of layers of ABABAB.....Any packing of spheres leaves out voids in the lattice. What is the percentage by volume of this lattice is empty space?

- (a) 67
(b) 74
(c) 71



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- (d) 69
55. The most probable value of 'r' for an electron in 1s orbital of hydrogen atom is
- (a) $a_0/2$
 - (b) $2a_0$
 - (c) $1/a_0$
 - (d) a_0
56. Number and symmetry type of normal modes of vibration of water molecule is
- (a) 3 and $2A_1+B_2$
 - (b) 3 and $2A_1+A_2$
 - (c) 3 and $2A_1+B_1$
 - (d) 4 and $3A_1+B_2$
57. Conductivity of 0.01M NaCl is $0.00147 \text{ S cm}^{-1}$. What happens to this conductivity if extra 100 mL of water is added.
- (a) Increases
 - (b) Decreases
 - (c) Remains unchanged
 - (d) First increases and then decreases
58. For an inverse spinel AB_2O_4 , A and B respectively can be
- (a) Ni(II) and Ga(III)
 - (b) Zn(II) and Fe(III)
 - (c) Fe(II) and Cr(III)
 - (d) Mn(II) and Mn(III)
59. At high pressure, the fugacity coefficient of real gas is greater than one because
- (a) Attractive term overweighs repulsive term
 - (b) Repulsive term overweighs attractive term
 - (c) Repulsive term is equal to attractive term
 - (d) The system is independent of both repulsive and attractive term
60. Kohlrausch's law is applicable to a dilute solution of
- (a) Potassium chloride in hexane
 - (b) Acetic acid in water
 - (c) Hydrochloric acid in water
 - (d) Benzoic acid in hexane
61. For urranocene the correct statements are
- 1) Oxidation state of uranium is +4

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- 2) It has cyclooctatetraenide ligands
3) It is bent sandwich compound
4) It has -2 charge
- (a) 1 and 2
(b) 2 and 3
(c) 1 and 4
(d) 2 only
62. An element 'X' emits successively two beta particles, one alpha particle, one positron and one neutron. The mass and atomic number of the element is decreased by respectively
- (a) 4 and 1
(b) 5 and 1
(c) 3 and 2
(d) 3 and 1
63. Molar conductivity of ionic solution depends on
- 1) Temperature
2) Distance between electrodes
3) Concentration of electrolytes in solution
4) Surface area of electrodes
- (a) 1,2,3
(b) 1,4
(c) 2,4
(d) 1,3
64. Stabilisation of highest oxidation state of transition metals by strong electronegative ligands is due to
- (a) $d\pi(L) \rightarrow d\pi(M)$ bonding
(b) $p\pi(L) \rightarrow d\pi(M)$ bonding
(c) $d\pi(M) \rightarrow p\pi(L)$ bonding
(d) $d\pi(M) \rightarrow d\pi(L)$ bonding
65. Vapour pressure of water above pure liquid water are 24, 529 and 760 torr respectively at 298, 363 and 373 Kelvin. Change in chemical potential (in KJ/mol) for the equilibrium between $H_2O(\text{liquid})$ and $H_2O(\text{gas})$ is
- (a) 8.6
(b) -3.8
(c) 7.87

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- (d) 3.82
66. A 5V battery delivers a steady current of 1.5 A for a period of 2 hours. The total charge that has passed through the circuit is ----- coulombs
- (a) 10800
 - (b) 96500
 - (c) 14400
 - (d) 7200
67. Structure of carborane with formula $C_2B_4H_8$ is formally derived from
- (a) Closo borane
 - (b) Nido borane
 - (c) Arachno borane
 - (d) Clado borane
68. The excess molar entropy of mixing a liquid A with liquid B is $R \ln 2$. The experimentally observed change in entropy upon mixing 1 mol of liquid A and 1 mol of liquid B is
- (a) $-2R \ln 2$
 - (b) $4R \ln 2$
 - (c) 0
 - (d) $R \ln 2$
69. When the electric current is passed through a cell having an electrolyte, the positive ions move towards cathode and negative ions towards anode. If cathode is pulled out of the solution then
- (a) +ve and -ve ions move towards anode
 - (b) +ve ions will start moving towards anode while -ve ions stops moving
 - (c) -ve ions will continue to move towards anode while +ve ions stop moving
 - (d) +ve and -ve ions will start moving randomly
70. The coordination geometries around the copper ion of plastocyanin (a blue copper protein) in oxidised and reduced form, respectively are
- (a) Tetrahedral and square planar
 - (b) Square planar and tetrahedral
 - (c) Distorted tetrahedral for both
 - (d) Ideal tetrahedral for both
71. The number of EPR signals observed for octahedral Ni(II) complexes is

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- (a) One
(b) Two
(c) Three
(d) Zero
72. In 0.1 M HCl and 0.1M NaCl solution, which will have greater transport number for Cl⁻ ion?
(a) NaCl
(b) Same for both
(c) HCl
(d) Insufficient data
73. When one CO group is replaced by PPh₃ in [Cr(CO)₆], the correct statement is
(a) Cr-C bond length increases and CO bond length decreases.
(b) Cr-C bond length decreases and CO bond length also decreases.
(c) Cr- C bond length decreases and CO bond length increases.
(d) Cr-C bond length increases and CO bond length also increases.
74. The mean ionic activity coefficient of 0.0005 mol kg⁻¹ CaCl₂ in water at 25°C is
(a) 0.81
(b) 0.72
(c) 1
(d) 0.91
75. Which one of the following shows charge transfer band?
(a) Lanthanum nitrate
(b) Ceric ammonium nitrate
(c) Manganese (II) acetate
(d) Copper (II) sulphate pentahydrate
76. Given the standard potential for the following half cell reaction at 298K
 $\text{Cu}^+(\text{aq}) + \text{e}^- \rightarrow \text{Cu}(\text{s}) \quad E^\circ = 0.52\text{V}$
 $\text{Cu}^{2+}(\text{aq}) + \text{e}^- \rightarrow \text{Cu}^+(\text{aq}) \quad E^\circ = 0.16\text{V}$
Calculate ΔG° (KJ) for the reaction
 $2\text{Cu}^+(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{Cu}^{2+}(\text{aq})$
(a) -34.740
(b) -65.720
(c) -69.180
(d) -131.440
77. The lowest allowed energy is equal to zero for
(a) The hydrogen atom

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- (b) A rigid rotor
(c) Harmonic oscillator
(d) Particle in 3-D box
78. Conductometric titration of a strong acid with strong base (MOH) shows linear fall of conductance upto neutralization point because of
(a) Formation of water
(b) Increase in alkali concentration
(c) Fast moving H^+ being replaced by slow moving M^+ ion
(d) Neutralization of acid
79. Set of ions expected to show Jahn Teller distortion in their complexes is
(a) $Ti(III)$, $Cu(II)$, high spin $Fe(III)$
(b) $Cu(I)$, $Ni(II)$, high spin $Fe(III)$
(c) $Cu(II)$, low spin $Fe(III)$, $Ti(III)$
(d) Low spin $Fe(III)$, $Mn(II)$, $Cu(I)$
80. If the concentration (c) is increased to 4 times it's original value, the change in molar conductivity for strong electrolytes is (where b is Kohlrausch's constant)
(a) 0
(b) $2b\sqrt{c}$
(c) $b\sqrt{c}$
(d) $4b\sqrt{c}$
81. Given the data at $25^\circ C$,
 $E^\circ (Cl_2/Cl^-) = 1.35 V$, $K_{sp} (AgCl) = 10^{-10}$,
 E° corresponds to the reaction $\frac{1}{2} Cl_2 + Ag^+ + e^- \rightarrow AgCl$
(where K_{sp} = solubility product, $2.303RT/F = 0.06 V$)
(a) 0.75 (b) 1.05
(c) 1.6 (d) 1.95
82. The compound which obeys 18 electron rule is
(a) $(C_2H_5)_5Mn(CO)_3$ (b) $Mn(acac)_3$
(c) $Cu(NH_3)_6^{2+}$ (d) $Ni(en)_3^{2+}$
83. Which value of Van't Hoff factor (i) represents association of solute in solution?
(a) $i = 0$ (b) $i = 1$



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- (c) $i > 1$ (d) $i < 1$

84. Among the electrolytes Na_2SO_4 , CaCl_2 , $\text{Al}_2(\text{SO}_4)_3$ and NH_4Cl , the most effective coagulating agent for Sb_2S_3 sol is

- (a) Na_2SO_4 (b) CaCl_2
(c) $\text{Al}_2(\text{SO}_4)_3$ (d) NH_4Cl

85. The gas phase decomposition of phosgene gas follows the rate law: $r = k[\text{phosgene}]^{3/2}$.

Unit of its rate constant is

- (a) atm (b) $\text{atm}^{-2}\text{s}^{-1}$
(c) $\text{atm}^{3/2}\text{s}^{-1}$ (d) $\text{atm}^{-1/2}\text{s}^{-1}$

86. Ziegler- Natta catalyst is

- (a) $\text{TiCl}_4 + \text{Al}(\text{C}_2\text{H}_5)_3$ (b) TiCl_4
(c) $\text{AlCl}_3 + \text{Al}(\text{C}_2\text{H}_5)_3$ (d) AlCl_3

87. The crystal field stabilization energy will be the highest for

- (a) CoF_6^{3-} (b) $\text{Co}(\text{NH}_3)_6^{3+}$
(c) $\text{Co}(\text{CNS})_4^{2-}$ (d) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$

88. For a one component system, the maximum number of phases that can co-exist at equilibrium is

- (a) 3 (b) 2 (c) 1 (d) 4

89. For a zero order reaction, when the concentration of reactant doubles, the half life

- (a) No change
(b) Increase four times
(c) Becomes half
(d) Becomes double

90. The constant volume heat capacity of a solid is given by the formula $C_v = aT^3$ where a is

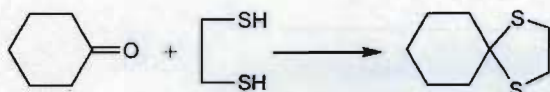
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the material constant. What is the change in entropy if 3 moles of the material is heated from 20K to 30K?

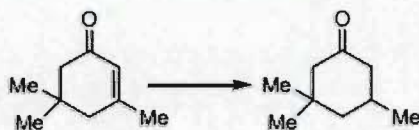
- (a) 9500a (b) 6333a
(c) 57000a (d) 19000a

91. A suitable catalyst for bringing out the transformation given below is:



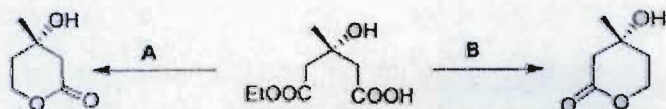
- (a) $\text{BF}_3 \cdot \text{Et}_2\text{O}$
(b) NaOEt
(c) Tungsten lamp
(d) Dibenzoyl peroxide

92. The most suitable reagent for the following transformation is:



- (a) LiAlH_4
(b) $\text{NH}_2\text{NH}_2/\text{KOH}$
(c) $\text{NaBH}_4/\text{CeCl}_3$
(d) $\text{Li}/\text{liq. NH}_3$

93. Identify appropriate reagents A and B in the following reactions

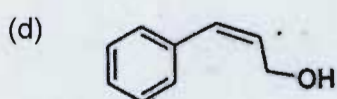
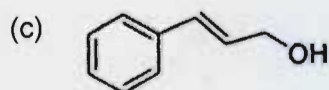
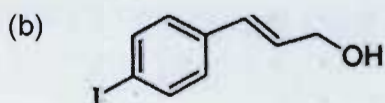
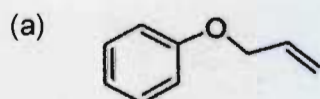
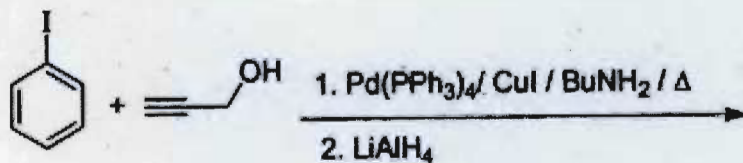


- (a) A = LiAlH_4 B = $\text{BH}_3 \cdot \text{Me}_2\text{S}$
(b) A = $\text{BH}_3 \cdot \text{Me}_2\text{S}$ B = LiAlH_4
(c) A = LiBH_4 B = $\text{BH}_3 \cdot \text{Me}_2\text{S}$
(d) A = $\text{BH}_3 \cdot \text{Me}_2\text{S}$ B = LiBH_4

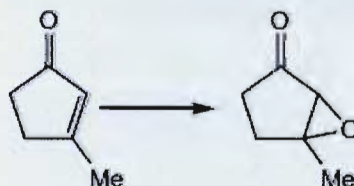
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94. The major product formed in the following reaction is

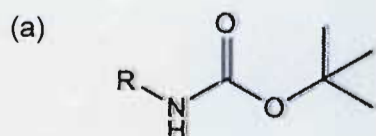


95. The suitable reagent for the following conversion is



- (a) m-CPBA
- (b) H₂O₂/AcOH
- (c) tBuOH/HCl
- (d) H₂O₂/NaOH

96. Among the following, the compound that undergoes deprotection easily on treatment with hydrogen in the presence of 10% Pd/C to generate RNH₂ is

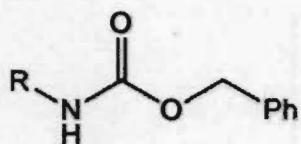


Handwritten signature

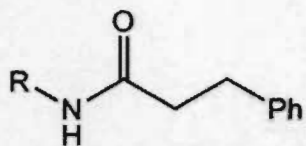
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QUESTION PAPER

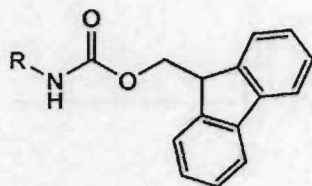
(b)



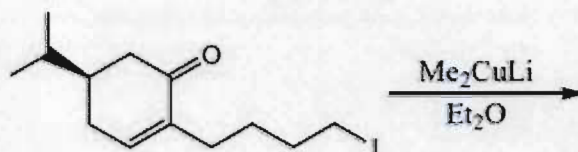
(c)



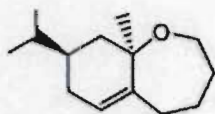
(d)



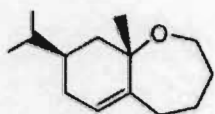
97. The major product formed in the following reaction is:



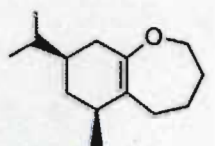
(a)



(b)

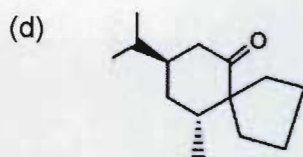


(c)

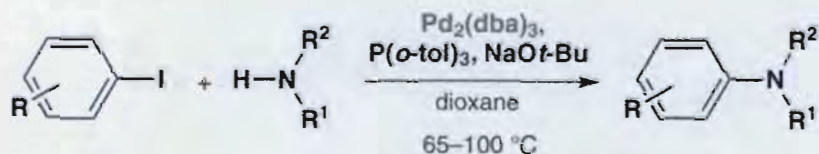


RECRUITMENT TO THE POST OF TECHNICAL ASSISTANT (INSTRUMENTS)-A

QUESTION PAPER

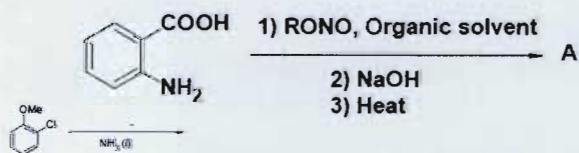


98. What is the name of the below reaction



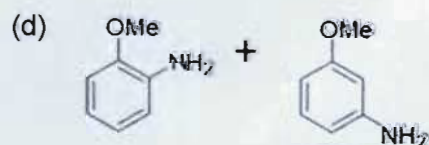
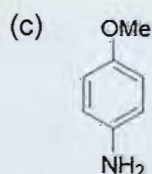
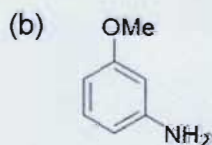
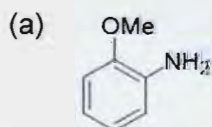
- (a) Gabriel phthalimide synthesis
- (b) Ullmann reaction
- (c) Buchwald-Hartwig Reaction
- (d) Chan-Lam coupling

99. Predict the reaction product (A)




- (a) Benzene
- (b) Benzoic acid
- (c) Phenol
- (d) Benzyne

~~100.~~ Predict the product



Answer Key - Technical Assistant
(Government) - A

Answers

1. d
2. c
3. b
4. c
5. a
6. d
7. d
8. d
9. c
10. a
11. c
12. c
13. b
14. d
15. d
16. b
17. d
18. d
19. b
20. b
21. a
22. b
23. a
24. d
25. d
26. b
27. c
28. b
29. a
30. ~~d~~ deleted 



- 31. d
- 32. b
- 33. d
- 34. b
- 35. a
- 36. c
- 37. b
- 38. a
- 39. c
- 40. d
- 41. c
- 42. b
- 43. a
- 44. b
- 45. d
- 46. c
- 47. a
- 48. d
- 49. d
- 50. b
- 51. a
- 52. c
- 53. c
- 54. b
- 55. d
- 56. c
- 57. b
- 58. a
- 59. b
- 60. c
- 61. a



- 62. b
- 63. d
- 64. b
- 65. c
- 66. a
- 67. b
- 68. c
- 69. d
- 70. c
- 71. a
- 72. a
- 73. c
- 74. d
- 75. b
- 76. a
- 77. b
- 78. c
- 79. c
- 80. c
- 81. d
- 82. a
- 83. d
- 84. c
- 85. d
- 86. a
- 87. b
- 88. a
- 89. d
- 90. d
- 91. a
- 92. b



93. c

94. c

95. d

96. b

97. d

98. c

99. d

100. ~~b~~ deleted ~~ff~~

~~ff~~