D-102

Domain Knowledge Test-2022

Chemistry

OMR Sr. No._____ Booklet Sr. No.

Time: **60 Minutes** Total Questions: **50** Max Marks: **100**

Roll No. (In figure)_____ (in words) _____

Signature of Candidate Signature of Invigilator

IMPORTANT

DO NOT OPEN THE BOOKLET UNLESS YOU ARE ASKED TO DO SO

FIRST READ FOLLOWING INSTRUCTIONS CAREFULLY

1. The candidate will fill up required particulars including his/her roll no. and signature on the OMR sheet with ball point pen (Black/Blue) in the appropriate boxes.
2. Question booklet and OMR sheet will be distributed to the candidates ten minutes before the commencement of the test.
3. Immediately on opening the question-booklet, the candidate should check the booklet and ensure that it contains 50 multiple choice objective type questions (Sr. No. **1** to **50**) and the OMR Sheet (Answer-Sheet) for answers and that none question is missing. Discrepancy, if any, should be reported by the candidate to the invigilator within 5 (five) minutes of the opening of the question booklet. If deem fit, a correct question booklet/OMR sheet shall be supplied.
4. **For each question, four suggested answers a, b, c, d are given. The candidate has to choose only one answer which he/she considers the correct or the most appropriate one. If candidate darkens more than one circle or cutting/overwriting/erasing putting of white fluid or any other chemicals on OMR Sheet, then such answer(s) shall not be evaluated.**
5. The answer should be marked by darkening appropriate circle provided in front of the concerned serial number, with **black/blue ball point pen only. Use of pencil is not allowed.** For instance, while answering the Question No. 26 of the question booklet, the correct answer **a** or **b** or **c** or **d** at Serial No. 26 of OMR sheet should only be darkened.
6. **Each correct answer will be awarded 02 marks. There will be NEGATIVE marking of 0.25% marks for each wrong answer in the Test.**
7. The candidate should be careful in handling the question-paper and in darkening the responses on the OMR Sheet. **The second question booklet/OMR sheet will not be supplied in any case.**
8. Bringing of in-criminal materials, electronic gadgets/devices including cell phone and calculators in the premises of the examination centre is strictly prohibited. Possessing of in-criminal materials, electronic gadgets/devices and any other aiding material in the examination hall will be a serious offence and will attract the cancellation of your candidature.
9. The candidate will not be permitted to leave the examination hall before the conclusion of the test. The candidate should make sure that question-booklet (including OMR sheet) is handed over to the invigilator before leaving the examination hall at the end of the test, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further, OMR-sheet of such a candidate will not be evaluated.
10. The candidate can do rough-work on the back of the title cover of question booklet. **Rough-work on OMR sheet is strictly prohibited.**

1. The number of metal-metal bond(s), with σ, π, and δ character, present in $[Mo_2(CH_3CO_2)_4]$ complex is(are), respectively,

A. 1, 2, 1

B. 1, 2, 0

C. 1, 1, 0

D. 1, 1, 1

2. The correct d-electron configuration showing spin-orbit coupling is—

A. $t_2g^6\ eg^2$

B. $t_2g^6\ eg^0$

C. $t_2g^4\ eg^0$

D. $t_2g^3\ eg^2$

3. Among the following, the strongest oxidizing agent is—

(A) $[WO_4]^{2-}$

(B) $[CrO_4]^{2-}$

(C) $[MoO_4]^{2-}$

(D) $[ReO_4]^{-1}$

4. The number of Ni-Ni bonds in $[CpNi(\mu\text{-}PPh_2)]_2$ complex obeying the 18 electron rule is

A. 0

B. 1

C. 2

D. 3

5. Consider σ– bonding only, in the MO diagram of a metal complex with trigonal bipyramidal (TBP) geometry, the d orbitals which remain non-bonding are :

A. dz^2 and dxz

B. dxz and dyz

C. dx^2-y^2 and dxy

D. dz^2 and dyz

6. The metal complex that exhibits a triplet as well as a doublet in its ^{31}P NMR spectrum is—

A. mer–$[IrCl_3(PPh_3)_3]$

B. trans–$[IrCl(CO)(PPh_3)_2]$

C. fac–$[IrCl_3(PPh_3)_3]$

D. $[Ir(PPh_3)_4]^+$

7. The number of metal-metal bonds in $Ir_4(CO)_{12}$ is

A. 4

B. 6

C. 10

D. 12

8. The reaction of decaborane $B_{10}H_{14}$ with acetylene in the presence of Et_2S gives

A. $C_2B_{10}H_{12}$

B. $C_2B_8H_{10}$

C. $C_2B_{10}H_{14}$

D. $C_2B_9H_{11}$

9. The geometry of $[ReH_9]^{2-}$ is

A. tricapped octahedron

B. monocapped cube

C. tricapped trigonal prism

D. heptagonal bipyramid

10. In compound $N_3P_3F_6$, the geometry around nitrogen and phosphorus, respectively, are:

A. pyramidal and tetrahedral

B. planar and tetrahedral

C. pyramidal and planar

D. planar and trigonal bipyramidal

11. Which of the following is amphoteric?

(A) CrO

(B) Cr_2O_3

(C) CrO_5

(D) CrO_3

12. The cluster having arachno type structure is—

(A) $[Os_5(CO)_{16}]$

(B) $[Os_3(CO)_{12}]$

(C) $[Ir_4(CO)_{12}]$

(D) $[Rh_6(CO)_{16}]$

13. The final product of the reaction $[Mn(CO)_6]^+ + MeLi \rightarrow$ is—

(A) $[Mn(CO)_6]^-$ Me

(B) $[Mn(CO)_5$ Me]

(C) $[Mn(CO)_6]$

(D) $[(MeCO)Mn(CO)_5]$

14. The correct set of the biologically essential elements is—

(A) Fe, Mo, Cu, Zn

(B) Fe, Cu, Co, Ru

(C) Cu, Mn, Zn, Ag

(D) Fe, Ru, Zn, Mg

15. Which of the following prevents the inactivation of nitrogenase by oxygen?

(A) Cytochrome

(B) Carotene

(C) Xanthophyll

(D) Leghaemoglobin

16. According to Debye-Huckel limiting law for an aqueous solution, the correct equation is:

(a) $\log \gamma_{\pm} = -0.509 |Z_+Z_-| \sqrt{I}$ (b) $\log \gamma_{\pm} = 0.509 |Z_+Z_-| \sqrt{I}$

(c) $\log \gamma_{\pm} = -0.509 |Z_+Z_-| I^2$ (d) $\log \gamma_{\pm} = 0.509 |Z_+Z_-| I$

17. An operator A is defined as $A = -d/dx + x$. Which one of the following statement is true?

(a) A is Hermitian operator.
(b) $A^!$ is antihermitian operator.
(c) Both $AA^!$ And $A^!A$ are Hermitian.
(d) $AA^!$ is Hermitian, but $A^!A$ antihermitian.

18. Difference in energy levels of n = 2 and n = 1 of a particle in one dimensional box is 9 units of energy. In the same units, what is the difference in energy levels of n =3 and n= 2 for above system?

(a) 15 (b) 10 (c) 5 (d) 4

19. Which of the molecules, C_2, N_2, O_2, and CN would you expect to be stabilized by addition of an electron to form AB^-.

(a) N_2 (b) O_2 (c) C_2 and CN (d) Both N_2 and O_2

20. If the reduced mass of a diatomic molecule is increased four times without changing its force constant, the vibrational frequency of molecule will be

(a) No change in frequency (b) Two times the original frequency

(c) Four times the original frequency (d) Half of the original frequency

21. The energy level of the harmonic oscillator (neglecting zero point energy) are $\varepsilon_v = nh\nu$ for n = 0, 1, 2, ... ∞. Assuming $h\nu = k_B T$, the partition function is:

(a) e (b) 1-(1/e) (c) 1/(1-1/e) (d) 1/e

22. The pressure for a system at constant composition is given by:

(a) $(dV/dS)_T$ (b) $-(dU/dS)_V$

(c) $(dU/dV)_T$ (d) $-(dU/dV)_S$

23. Kohlrausch's law is applicable to a dilute solution of

(a) Sodium chloride in benzene (b) Hydrochloric acid in water
(c) Benzoic acid in hexane (d) Hydrochloric acid in benzene

24. In case of weak acid vs weak base conductometric titration, the conductance will:
(a) increase linearly and after end point will decrease linearly
(b) increase linearly and after end point will become constant
(c) decrese linearly and after end point will increase linearly
(d) decrease exponentially

25. If the concept of half-life is generalized to quarter-life of a first order chemical reaction, it will be equal to
(a) 1/2k (b) ln2 /k (c) 2/k (d) ln4/ k

26. The rate constant k at 27°C for a reaction is $k = 11.5 \times e^{-40}$. The activation energy of the reaction is:
(a) 460 J mol^{-1} (b) 997.64 J mol^{-1} (c) 99764 J mol^{-1} (d) 40 J mol^{-1}

27. In case of Langmuir isotherm, the fraction coverage at low pressure is:
(a) Directly proportional to pressure
(b) Inversely proportional to pressure
(c) Independent of pressure
(d) Directly proportionally to square of pressure

28. In a cubic crystal, the value of d_{111} is 450 pm. The value of d_{333} is:
(a) 150 pm (b) 1350 pm (c) 450 pm (d) 50 pm

29. The equivalence point in the curve of emf (E) vs volume (V) of titrant added in the potentiometric titration is indicated by
(a) $d^2E/dV^2 < 0$ (b) $d^2E/dV^2 > 0$
(c) $d^2E/dV^2 = 0$ (d) $dE/dV = 0$

30. Kinetic chain length in free radical polymerization is measured by:
(a) rate of termination / rate of initiation
(b) rate of initiation / rate of termination
(c) rate of propagation / rate of initiation
(d) rate of initiation / rate of propagation

31. Among the followings, the most suitable diene in the Diels Alder reaction is

a) Pyrrole
b) Thiophene
c) Pyridine
d) Furan

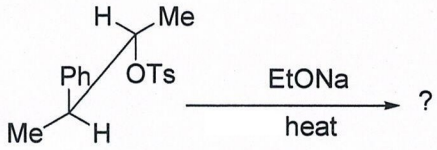
32. The intermediate formed in the following process is

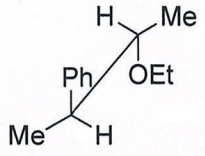
a) Carbene
b) Benzyne
c) Nitrene
d) Free radical

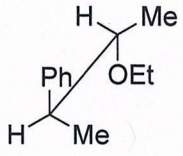
33. Betaine is an intermediate in

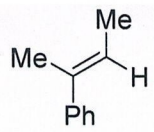
a) Wittig reaction
b) Robinson annelation
c) Reformatsky reaction
d) Stobbe reaction

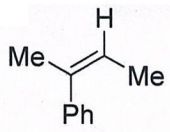
34. The major product formed in the following reaction is



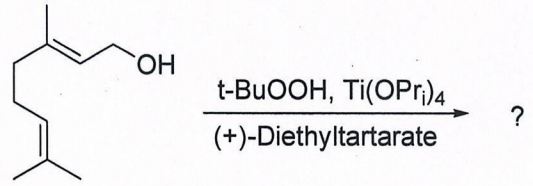
a)


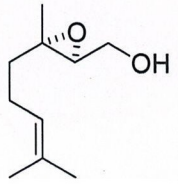
b)


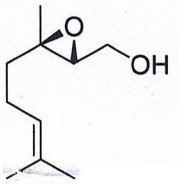
c)


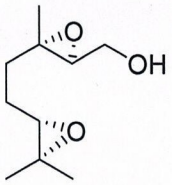
d)


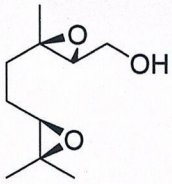
35. The major product formed in the following reaction is



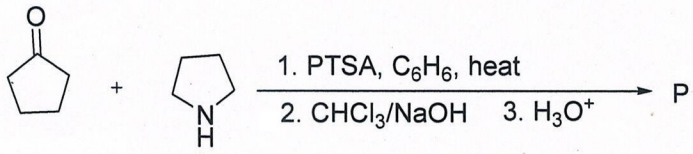
a) 

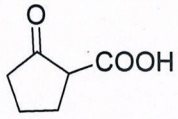
b) 

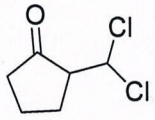
c) 

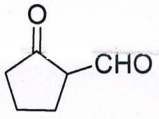
d) 

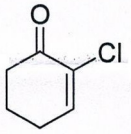
36. In the following reaction sequence, the major product P is



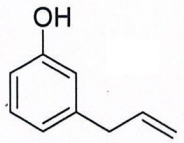
a) 

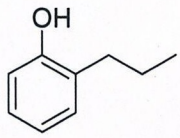
b) 

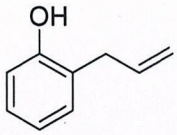
c) 

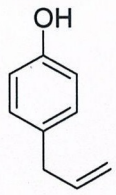
d) 

37. The allyl phenyl ether on heating at 200°C gives the major product

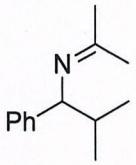
a) 

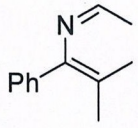
b) 

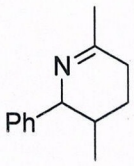
c) 

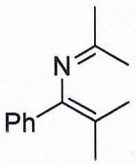
d) 

38. Benzonitrile on irradiation with 2,3-dimethylbut-2-ene furnishes

a) 

b) 

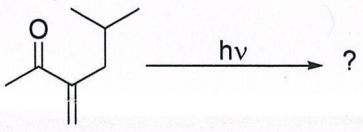
c) 

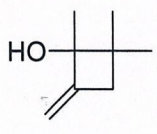
d) 

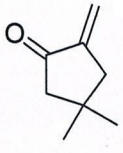
39. The ΔG in the photochemical reaction is

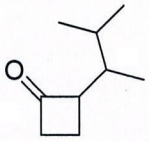
a) always zero
b) may be negative or positive
c) always positive
d) always negative

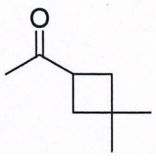
40. The major product formed in the following photochemical transformation is



a) 

b) 

c) 

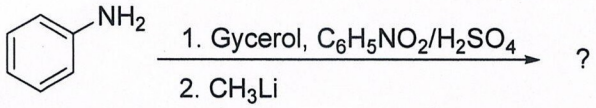
d) 

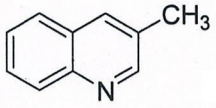
41. The heterocyclic ring present in the amino acid His is

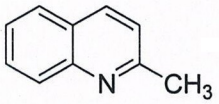
a) Imidazole b) Pyridine

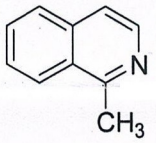
c) Pyrrole d) Indole

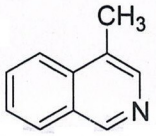
42. The major product formed in the following reaction is



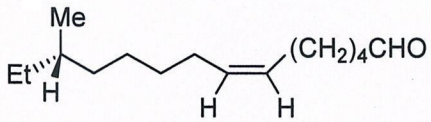
a) 

b) 

c) 

d) 

43. The designation for the chiral centre and the geometrical configuration of the compound **A** will be

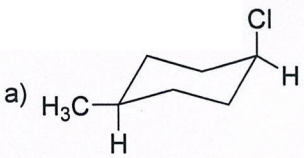


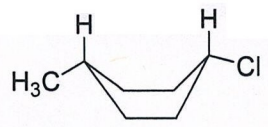
A

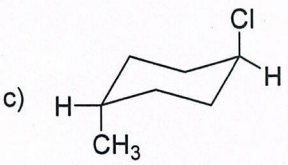
a) *R* and *Z* b) *R* and *E*

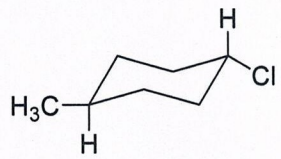
c) *S* and *trans* d) *S* and *Z*

44. The most stable conformation of 1-chloro-4-methylcyclohexane is

a) 

b) 

c) 

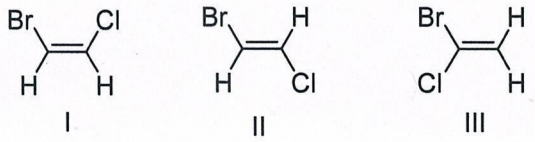
d) 

45. The compound which exhibits sharp bands at 3300 and 2150 cm^{-1} in the IR spectrum is

a) Butyronitrile b) 2-Butyne

c) Butylamine d) 1-Butyne

46. The correct order of coupling constant [^{1}H J(Hz)] in the molecules I,II and III is



a) II > III > I b) III > I > II

c) I > II > III d) II > I > III

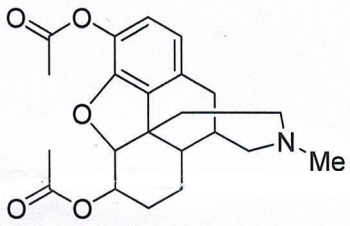
47. An example of a local anaesthetic agent is

a) Procaine b) Diazepam

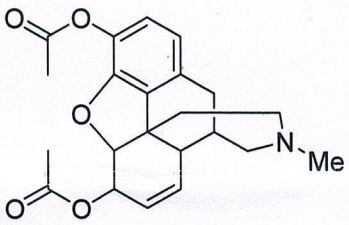
c) Mascaline d) Histidine

48. The structure of the heroin is

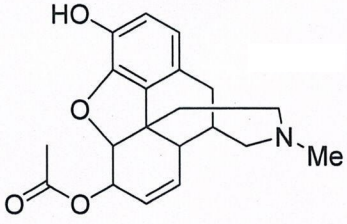
a)



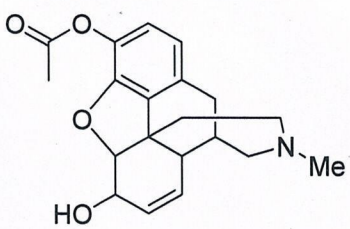
b)



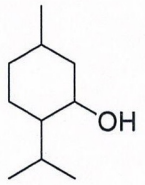
c)

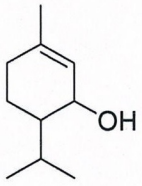


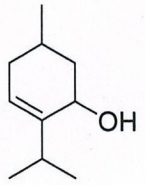
d)

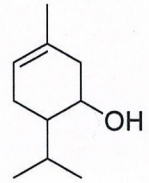


49. Which one of the following molecules is menthol?

a) 

b) 

c) 

d) 

50. Which moiety is not present in nucleic acids

a) Cytosine b) Adenine

c) Thiamine d) Guanine

****

ROUGH WORK

ROUGH WORK

****