JEE-MAIN EXAM FEBRUARY, 2024

Date: - 01-02-2024 (SHIFT-1)

CHEMISTRY

SECTION-A

1. If one strand of a DNA has the sequence ATGCTTCA, sequence of the bases in complementary strand is:

(1) CATTAGCT (2) TACGAAGT

(3) GTACTTAC (4) ATGCGACT

2. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Haloalkanes react with KCN to form alkyl cyanides as a main product while with $AgCN$ form isocyanide as the main product.

Reason (R) : KCN and $AgCN$ both are highly ionic compounds.

In the light of the above statement, choose the most appropriate answer from the options given below:

(1) (A) is correct but (R) is not correct

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is not correct but (R) is correct

(4) Both (A) and (R) are correct and (R) is the correct explanation of (A)

3. In acidic medium, $K_2Cr_2O_7$ shows oxidising action as represented in the half reaction

$Cr_2O_7^{2-} + XH^+ + Ye^- \rightarrow 2\,A + ZH_2O$

X, Y, Z and A are respectively are:

(1) $8,6,4$ and Cr_2O_3 (2) $14,7,6$ and Cr^{3+}

(3) 8, 4, 6 and Cr_2O_3 (4) $14,6,7$ and Cr^{3+}

4. Which of the following reactions are disproportionation reactions?

(A) $Cu^+ \rightarrow Cu^{2+} + Cu$

(B) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(C) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

(D) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^+$

Choose the correct answer from the options given below:

(1) (A), (B) (2) (B), (C), (D)

(3) (A), (B), (C) (4) (A), (D)

5. In case of isoelectronic species the size of F^-, Ne and $Na^+$is affected by:

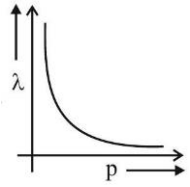
(1) Principal quantum number (n)

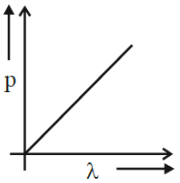
(2) None of the factors because their size is the same

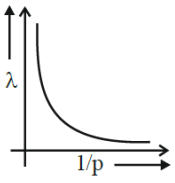
(3) Electron-electron interaction in the outer orbitals

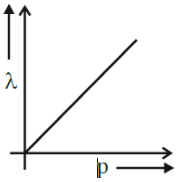
(4) Nuclear charge (z)

6. According to the wave-particle duality of matter by de-Broglie, which of the following graph plot presents most appropriate relationship between wavelength of electron (λ) and momentum of electron (p) ?

(1) 

(2) 

(3) 

(4) 

7. Given below are two statements:

Statement (I): A solution of $[Ni(H_2O)_6]^{2+}$ is green in colour.

Statement (II): A solution of $[Ni(CN)_4]^{2-}$ is colourless.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are incorrect

(2) Both Statement I and Statement II are correct

(3) Statement I is incorrect but Statement II is correct

(4) Statement I is correct but Statement II is incorrect

8. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): PH_3 has lower boiling point than NH_3.

Reason (R) : In liquid state NH_3 molecules are associated through vander waal's forces, but PH_3 molecules are associated through hydrogen bonding. In the light of the above statements, choose the most appropriate answer from the options given below:

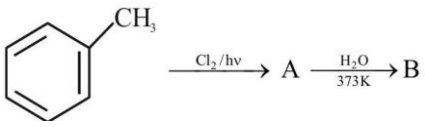
(1) Both (A) and (R) are correct and (R) is not the correct explanation of (A)

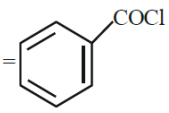
(2) (A) is not correct but (R) is correct

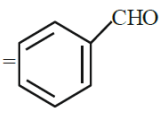
(3) Both (A) and (R) are correct but (R) is the correct explanation of (A)

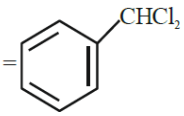
(4) (A) is correct but (R) is not correct

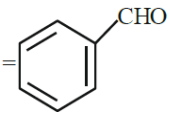
9. Identify A and B in the following sequence of reaction

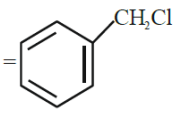


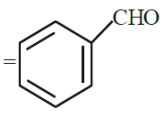
(1) (A) = 

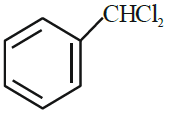
(B) = 

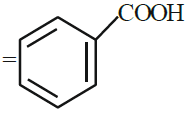
(2) (A) = 

(B) = 

(3) (A) = 

(B) = 

(4) (A) = 

(B) = 

10. Given below are two statements:

Statement (I) : Aminobenzene and aniline are same organic compounds.

Statement (II) : Aminobenzene and aniline are different organic compounds.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

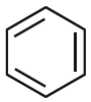
(4) Both Statement I and Statement II are incorrect

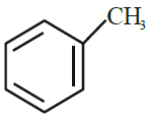
11. Which of the following complex is homoleptic?

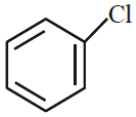
(1) $[Ni(CN)_4]^{2-}$ (2) $[Ni(NH_3)_2Cl_2]$

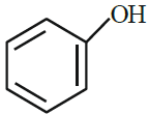
(3) $[Fe(NH_3)_4Cl_2]^+$ (4) $[Co(NH_3)_4Cl_2]^+$

12. Which of the following compound will most easily be attacked by an electrophile?

(1) 

(2) 

(3) 

(4) 

13. Ionic reactions with organic compounds proceed through:

(A) Homolytic bond cleavage

(B) Heterolytic bond cleavage

(C) Free radical formation

(D) Primary free radical

(E) Secondary free radical

Choose the correct answer from the options given below:

(1) (A) only (2) (C) only (3) (B) only (4) (D) and (E) only

14. Arrange the bonds in order of increasing ionic character in the molecules. LiF, K_2O, N_2, SO_2 and ClF_3.

(1) $ClF_3 < N_2 < SO_2 < K_2O < LiF$ (2) $LiF < K_2O < ClF_3 < SO_2 < N_2$

(3) $N_2 < SO_2 < ClF_3 < K_2O < LiF$ (4) $N_2 < ClF_3 < SO_2 < K_2O < LiF$

15. We have three aqueous solutions of $NaCl$ labelled as ' A ', ' B ' and ' C ' with concentration $0.1M$, $0.01M \& 0.001M$, respectively. The value of van t' Haft factor (i) for these solutions will be in the order.

(1) $i_A < i_B < i_C$ (2) $i_A < i_C < i_B$ (3) $i_A = i_B = i_C$ (4) $i_A > i_B > i_C$

16. In Kjeldahl's method for estimation of nitrogen, $CuSO_4$ acts as :

(1) Reducing agent (2) Catalytic agent (3) Hydrolysis agent (4) Oxidising agent

17. Given below are two statements :

Statement (I) : Potassium hydrogen phthalate is a primary standard for standardisation of sodium hydroxide solution.

Statement (II) : In this titration phenolphthalein can be used as indicator.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

(4) Both Statement I and Statement II are incorrect

18. Match List - I with List -II.

List – I (Reactions)		List – II (Reagents)	
(A)	$CH_3(CH_2)_5-\underset{\underset{O}{\|}}{C}-OC_2H_5 \rightarrow CH_3(CH_2)_5CHO$	(I)	CH_3MgBr, H_2O
(B)	$C_6H_5COC_6H_5 \rightarrow C_6H_5CH_2C_6H_5$	(II)	Zn(Hg) and conc. HCl
(C)	$C_6H_5CHO \rightarrow C_6H_5CH(OH)CH_3$	(III)	$NaBH_4$, H^+
(D)	$CH_3COCH_2COOC_2H_5 \rightarrow CH_3\underset{\underset{H}{\|}}{C}(OH)CH_2COOC_2H_5$	(IV)	DIBAL-H, H_2O

Choose the correct answer from options given below:

(1) A-(III), (B)-(IV), (C)-(I), (D)-(II)

(2) A-(IV), (B)-(II), (C)-(I), (D)-(III)

(3) A-(IV), (B)-(II), (C)-(III), (D)-(I)

(4) A-(III), (B)-(IV), (C)-(II), (D)-(I)

19. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following :

(1) $q = 0, \Delta T \neq 0, w = 0$

(2) $q = 0, \Delta T < 0, w \neq 0$

(3) $q \neq 0, \Delta T = 0, w = 0$

(4) $q = 0, \Delta T = 0, w = 0$

20. Given below are two statements:

Statement (I) : The NH_2 group in Aniline is ortho and para directing and a powerful activating group.

Statement (II) : Aniline does not undergo Friedel-Craft's reaction (alkylation and acylation).

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is incorrect but Statement II is correct

(4) Statement I is correct but Statement II is incorrect

SECTION-B

21. Number of optical isomers possible for 2 – chlorobutan

22. The potential for the given half cell at 298 K is

$(-) \ldots\ldots\ldots \times 10^{-2}$ V.

$2H^+_{aq)} + 2e^- \rightarrow H_2(g)$

$[H^+] = 1M, P_{H_2} = 2$ atm

(Given: $2.303RT/F = 0.06$ V, $\log 2 = 0.3$)

23. The number of white coloured salts among the following is

(A) $SrSO_4$ (B) $Mg(NH_4)PO_4$ (c) $BaCrO_4$

(D) $Mn(OH)_2$ (E) $PbSO_4$ (F) $PbCrO_4$

(G) $AgBr$ (H) PbI_2 (I) CaC_2O_4

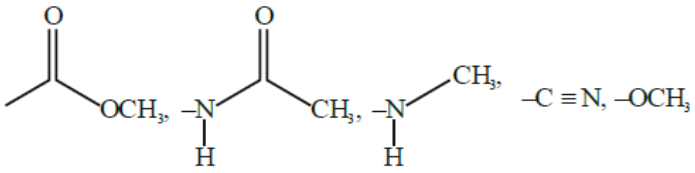
(J) $[Fe(OH)_2(CH_3COO)]$

24. The ratio of $\frac{^{14}C}{^{12}C}$ in a piece of wood is $\frac{1}{8}$ part that of atmosphere. If half life of ^{14}C is 5730 years, the age of wood sample is ..... years.

25. The number of molecules/ion/s having trigonal bipyramidal shape is

$PF_5, BrF_5, PCl_5, [PtCl_4]^{2-}, BF_3, Fe(CO)_5$

26. Total number of deactivating groups in aromatic electrophilic substitution reaction among the following is



27. Lowest Oxidation number of an atom in a compound A_2B is -2 . The number of an electron in its valence shell is

28. Among the following oxide of p - block elements, number of oxides having amphoteric nature is

$Cl_2O_7, CO, PbO_2, N_2O, NO, Al_2O_3, SiO_2, N_2O_5, SnO_2$

29. Consider the following reaction:

$3PbCl_2 + 2(NH_4)_3PO_4 \rightarrow Pb_3(PO_4)_2 + 6NH_4Cl$

If $72mmol$ of $PbCl_2$ is mixed with $50mmol$ of $(NH_4)_3PO_4$, then amount of $Pb_3(PO_4)_2$ formed is ..... mmol. (nearest integer)

30. K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5}. The pH of ammonium acetate solution will be

NTA ANSWERS

1.	**(2)**	**2.**	**(1)**	**3.**	**(4)**	**4.**	**(1)**	**5.**	**(4)**	**6.**	**(1)**	**7.**	**(2)**
8.	**(4)**	**9.**	**(2)**	**10.**	**(2)**	**11.**	**(1)**	**12.**	**(4)**	**13.**	**(3)**	**14.**	**(3)**
15.	**(1)**	**16.**	**(2)**	**17.**	**(1)**	**18.**	**(2)**	**19.**	**(4)**	**20.**	**(1)**	**21.**	**(2)**
22.	**(1)**	**23.**	**(5)**	**24.**	**(17190)**	**25.**	**(3)**	**26.**	**(2)**	**27.**	**(6)**	**28.**	**(3)**
29.	**(24)**	**30.**	**(7)**										