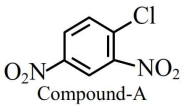
JEE-MAIN EXAM APRIL, 2024

Date: - 08-04-2024 (SHIFT-1)

CHEMISTRY

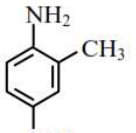
SECTION-A

1. Given below are two statements:

Statement I : 

Compound-A

IUPAC name of Compound A is 4-chloro-1, 3-dinitrobenzene:

Statement II: 

Compound-B

Compound-B

IUPAC name of Compound B is 4-ethyl-2-methylaniline.

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

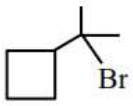
(1) Both Statement I and Statement II are correct

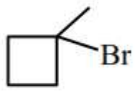
(2) Statement I is incorrect but Statement II is correct

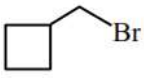
(3) Statement I is correct but Statement II is incorrect

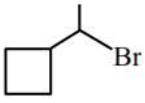
(4) Both Statement I and Statement II are incorrect

2. Which among the following compounds will undergo fastest S_N2 reaction.

(1) 

(2) 

(3) 

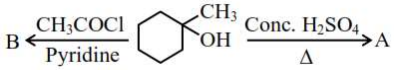
(4) 

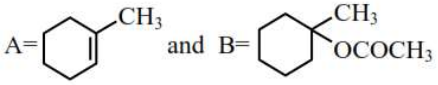
3. Combustion of glucose $(C_6H_{12}O_6)$ produces CO_2 and water. The amount of oxygen (in g) required for the complete combustion of 900 g of glucose is:

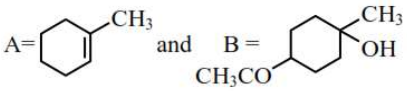
[Molar mass of glucose in $gmol^{-1} = 180$]

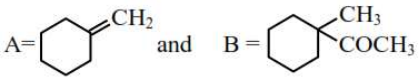
(1) 480 (2) 960 (3) 800 (4) 32

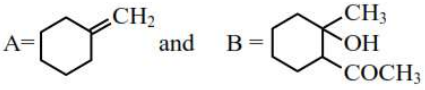
4. Identify the major products A and B respectively in the following set of reactions.



(1) 

(2) 

(3) 

(4) 

5. Given below are two statements : One is labelled as

Assertion **A** and the other is labelled as Reason R:

Assertion A : The stability order of +1 oxidation state of Ga, In and Tl is $Ga < In < Tl$.

Reason R : The inert pair effect stabilizes the lower oxidation state down the group.

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

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) **A** is true but **R** is false.

(3) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

(4) **A** is false but **R** is true.

6. Match List I with List-II

List-I (Name of the test)		List-II (Reaction sequence involved) [M is metal]	
A	Borax bead test	I.	$MCO_3 \rightarrow MO \xrightarrow[+\Delta]{Co(NO_3)_2} CoO.MO$
B.	Charcoal cavity test	II.	$MCO_3 \rightarrow MCl_2 \rightarrow M^{2+}$
C.	Cobalt nitrate test	III	$MSO_4 \xrightarrow[\Delta]{Na_2B_4O_7} M(BO_2)_2 \rightarrow MBO_2 \rightarrow M$
D.	Flame test	IV	$MSO_4 \xrightarrow[\Delta]{Na_2CO_3} MCO_3 \rightarrow MO \rightarrow M$

Choose the correct answer from the option below :

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

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

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

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

7. Match List I and with List II

List-I (Molecule)		List-II(Shape)	
A	NH_3	I.	Square pyramid
B.	BrF_5	II.	Tetrahedral
C.	PCl_5	III	Trigonal pyramidal
D.	CH_4	IV	Trigonal bipyramidal

Choose the correct answer from the option below :

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

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

8. For the given hypothetical reactions, the equilibrium constants are as follows:

$X \rightleftharpoons Y$; $K_1 = 1.0$

$Y \rightleftharpoons Z$; $K_2 = 2.0$

$Z \rightleftharpoons W$; $K_3 = 4.0$

The equilibrium constant for the reaction $X \rightleftharpoons W$ is

(1) 6.0 (2) 12.0 (3) 8.0 (4) 7.0

9. Thiosulphate reacts differently with iodine and bromine in the reaction given below :

$2\ S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$

$S_2O_3^{2-} + 5Br_2 + 5H_2O \rightarrow 2SO_4^{2-} + 4Br^- + 10H^+$

Which of the following statement justifies the above dual behaviour of thiosulphate?

(1) Bromine undergoes oxidation and iodine undergoes reduction by iodine in these reactions

(2) Thiosulphate undergoes oxidation by bromine and reduction by iodine in these reaction

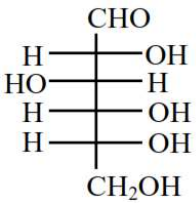
(3) Bromine is a stronger oxidant than iodine

(4) Bromine is a weaker oxidant than iodine

10. An octahedral complex with the formula $CoCl_3nNH_3$ upon reaction with excess of $AgNO_3$ solution given 2 moles of $AgCl$. Consider the oxidation state of Co in the complex is ' x '. The value of " $x + n$ " is

(1) 3 (2) 6 (3) 8 (4) 5

11.



The incorrect statement regarding the given structure is

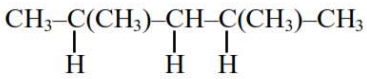
(1) Can be oxidized to a dicarboxylic acid with Br_2 water

(2) despite the presence of - CHO does not give Schiff's test

(3) has 4-asymmetric carbon atom

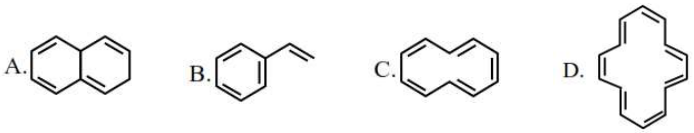
(4) will coexist in equilibrium with 2 other cyclic structure

12. In the given compound, the number of 2° carbon atom/s is



(1) Three (2) One (3) Two (4) Four

13. Which of the following are aromatic?



(1) B and D only (2) A and C only

(3) A and B only (4) C and D only

14. Among the following halogens

F_2, Cl_2, Br_2 and I_2

Which can undergo disproportionation reaction?

(1) Only I_2 (2) Cl_2, Br_2 and I_2 (3) F_2, Cl_2 and Br_2 (4) F_2 and Cl_2

15. Given below are two statements:

Statement I : $N(CH_3)_3$ and $P(CH_3)_3$ can act as ligands to form transition metal complexes.

Statement II: As N and P are from same group, the nature of bonding of $N(CH_3)_3$ and $P(CH_3)_3$ is always same with transition metals.

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

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

(2) Both Statement I and Statement II are correct

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

(4) Both Statement I and Statement II are incorrect

16. Match List I with List II

List-I (Elements)		List-II(Properties in their respective groups)	
A	Cl,S	I.	Elements with highest electronegativity
B.	Ge, As	II.	Elements with largest atomic size
C.	Fr, Ra	III	Elements which show properties of both metals and non metal
D.	F, O	IV	Elements with highest negative electron gain enthalpy

Choose the correct answer from the options given below :

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

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

17. Iron (III) catalyses the reaction between iodide and persulphate ions, in which

A. Fe^{3+} oxidises the iodide ion

B. Fe^{3+} oxidises the persulphate ion

C. Fe^{2+} reduces the iodide ion

D. Fe^{2+} reduces the persulphate ion

Choose the most appropriate answer from the options given below:

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

18. Match List I with List II

List-I (Compound)		List-II (Colour)	
A	$Fe_4[Fe(CN)_6]_3.xH_2O$	I.	Violet
B.	$[Fe(CN)_5NOS]^{4-}$	II.	Blood Red
C.	$[Fe(SCN)]^{2+}$	III.	Prussian Blue
D.	$(NH_4)_3PO_4.12MoO_3$	IV.	Yellow

Choose the correct answer from the options given below :

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

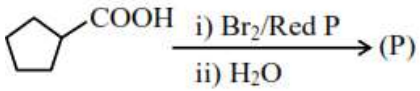
(3) A-II, B-III, C-IV, D-I (4) A-I, B-II, C-III, D-IV

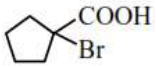
19. Number of complexes with even number of electrons in t_{2g} orbitals is -

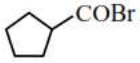
$[Fe(H_2O)_6]^{2+}, [Co(H_2O)_6]^{2+}, [Co(H_2O)_6]^{3+}, [Cu(H_2O)_6]^{2+}, [Cr(H_2O)_6]^{2+}$

(1) 1 (2) 3 (3) 2 (4) 5

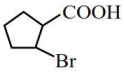
20. Identify the product (P) in the following reaction:



(1) 

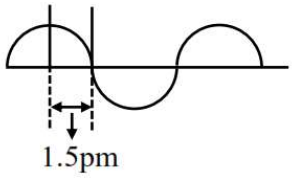
(2) 

(3) 

(4) 

SECTION-B

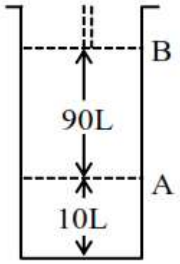
21. A hypothetical electromagnetic wave is show below.



The frequency of the wave is $x \times 10^{19}$ Hz.

x = _____ (nearest integer)

22.



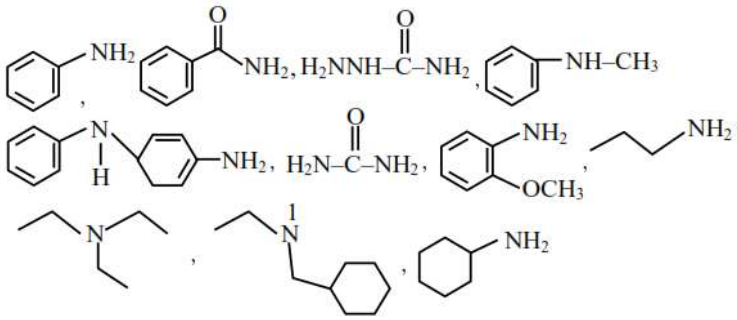
Consider the figure provided.

1 mol of an ideal gas is kept in a cylinder, fitted with a piston, at the position A, at 180ºC. If the piston is moved to position B, keeping the temperature unchanged, then 'x' L atm work is done in this reversible process.

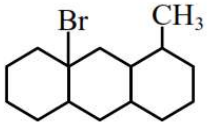
x = _____ L atm (nearest integer)

[Given : Absolute temperature $= {}^{\circ}\mathrm{C} + 273.15$, $\mathrm{R} = 0.08206\ \mathrm{L\ atm\ mol^{-1}\ K^{-1}}$]

23. Number of amine compounds from the following giving solids which are soluble in NaOH upon reaction with Hinsberg's reagent is _____.



24. The number of optical isomers in following compound is : _____ .



25. The 'spin only' magnetic moment value of $\mathrm{MO_4}^{2-}$ is BM. (Where M is a metal having least metallic radii. among $\mathrm{Sc, Ti, V, Cr, Mn}$ and Zn).

(Given atomic number: $\mathrm{Sc} = 21, \mathrm{Ti} = 22, \mathrm{V} = 23, \mathrm{Cr} = 24, \mathrm{Mn} = 25$ and $\mathrm{Zn} = 30$)

26. Number of molecules from the following which are exceptions to octet rule is

$\mathrm{CO_2, NO_2, H_2SO_4, BF_3, CH_4, SiF_4, ClO_2, PCl_5, BeF_2, C_2H_6, CHCl_3, CBr_4}$

27. If $279\ \mathrm{g}$ of aniline is reacted with one equivalent of benzenediazonium chloride, the mximum amount of aniline yellow formed will be g. (nearest integer)

(consider complete conversion)

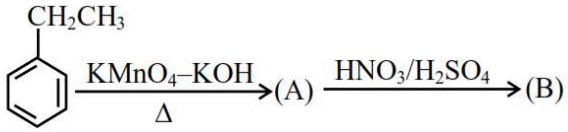
28. Consider the following reaction

$A + B \rightarrow C$

The time taken for A to become 1/4th of its initial concentration is twice the time taken to become 1/2 of the same. Also, when the change of concentration of B is plotted against time, the resulting graph gives a straight line with a negative slope and a positive intercept on the concentration axis.

The overall order of the reaction is

29. Major product B of the following reaction has π-bond.



30. A solution containing 10 g of an electrolyte AB_2 in 100 g of water boils at 100.52ºC. The degree of ionization of the electrolyte (α) is _____$\times 10^{-1}$. (nearest integer)

[Given : Molar mass of $AB_2 = 200\ g\ mol^{-1}$. K_b (molal boiling point elevation const. of water) = $0.52\ K\ kg\ mol^{-1}$, boiling point of water = $100°C$; AB_2 ionises as $AB_2 \rightarrow A^{2+} + 2\ B^-$]

NTA ANSWERS

1.	(2)	2.	(3)	3.	(2)	4.	(1)	5.	(1)	6.	(4)	7.	(3)
8.	(3)	9.	(3)	10.	(3)	11.	(1)	12.	(2)	13.	(1)	14.	(2)
15.	(3)	16.	(3)	17.	(4)	18.	(1)	19.	(2)	20.	(1)	21.	(5)
22.	(55)	23.	(5)	24.	(32)	25.	(0)	26.	(6)	27.	(591)	28.	(1)
29.	(5)	30.	(5)										