JEE MAIN 2024

Paper with Solution

Chemistry | 27th January 2024 _ Shift-1

SECTION – A

1. The correct statement regarding nucleophilic substitution reaction in a chiral alkyl halide is :
(1) Racemisation occurs in S_N1 reaction and inversion occurs in S_N2 reaction.
(2) Retention occurs in S_N1 reaction and inversion occurs in S_N2 reaction.
(3) Racemisation occurs in S_N1 reaction and retention occurs in S_N2 reaction.
(4) Racemisation occurs in both S_N1 and S_N2 reactions.

Ans. **1**

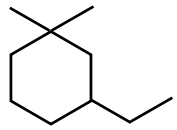
Recemisation occurs in SN^1 reaction, and inversion occurs in SN^2 Reaction.

2. Given below are two statement :
Statement (I) : The 4f and 5f – series of elements are placed separately in the periodic table to preserve the principle of classification.
Statement (II) : s-block element can be found in pure form in nature.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Both Statement I and Statement II are true
(4) Statement I is true but Statement II is false

Ans. **4**

S-block elements does not found in pure form, they are found as ore or minerals.

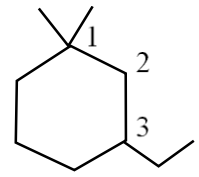
3. IUPAC name of following compound (P) is :



(P)

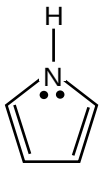
(1) 1-Ethyl-3,3-dimethylcyclohexane
(2) 1-Ethyl-5,5-dimethylcyclohexane
(3) 1,1-Dimethyl-3-ethylcyclohexane
(4) 3-Ethyl-1,1-dimethylcylohexane

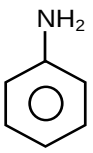
Ans. **4**

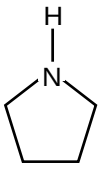


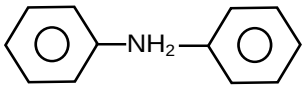
3-Ethyl-1,1-dimethylcylohexane

4. Which of the following is strongest Bronsted base ?

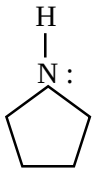
(1) 

(2) 

(3) 

(4) 

Ans. **3**



Due to presence of Localised L.P., It is strongest bronsted blase.

5. NaCl reacts with conc. H_2SO_4 and $K_2Cr_2O_7$ to give reddish fumes (B), which react with NaOH to give yellow solution (C). (B) and (C) respectively are :

(1) CrO_2Cl_2 , $KHSO_4$ (2) Na_2CrO_4 , CrO_2Cl_2 (3) CrO_2Cl_2 , Na_2CrO_4 (4) CrO_2Cl_2, $Na_2Cr_2O_7$

Ans. **3**

$$NaCl + K_2Cr_2O_7 + \underset{\text{cone.}}{H_2SO_4} \rightarrow \underset{(B)}{CrO_2Cl_2} \text{ Red Fames} \xrightarrow{NaOH} Na_2CrO_4 \text{ Yellow Solution}$$

6. Cyclohexene  is _____ type of an organic compound.

(1) Benzenoid non-aromatic (2) Benzenoid aromatic

(3) Alicyclic (4) Acyclic

Ans. **3**

 is alicyclic compound

7. Given below are two statement :

Statement (I) : Aqueous solution of ammonium carbonate is basic

Statement (II) : Acidic/basic nature of salt solution of a salt of weak acid and weak base depends on K_a and K_b value of acid and the base forming it.

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

Ans. **1**

Statement I – Fact

Statement II – Fact

8. Two nucleotides are joined together by a linkage known is :

(1) Peptide linkage (2) Disulphide linkage

(3) Phosphodiester linkage (4) Glycosidic linkage

Ans. **3**

Phosphodiester linkage

9. The electronic configuration for Neodymium is :
[Atomic Number for Neodymium 60]
(1) $[Xe]\ 5f^7\ 7s^2$ (2) $[Xe]\ 4f^6\ 6s^2$ (3) $[Xe]\ 4f^4\ 6s^2$ (4) $[Xe]\ 4f^1\ 5d^1\ 6s^2$

Ans. **3**
Electronic confagution of 'Nd'
$[Xe]\ 4f^4\ 6s^2$

10. A solution of two miscible liquids showing negative deviation from Raoult's law will have ?
(1) decreased vapour pressure, increased boiling point
(2) increased vapour pressure, decreased boiling point
(3) decreased vapour pressure, decreased boiling point
(4) increased vapour pressure, increased boiling point

Ans. **1**
A solution at two miscible liquid showing negative deviation from Raoult's law then vapour pressure will decrease increasing its boiling point.

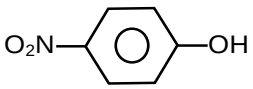
11. Choose the polar molecule from the following :
(1) $CHCl_3$ (2) CCl_4 (3) CO_2 (4) $CH_2 = CH_2$

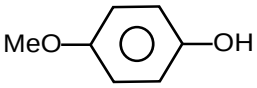
Ans. **1**

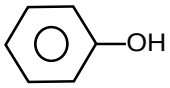
CCl_4, CO_2 and $CH_2 = CH_2$ are non-polar molecule due to symmetry.

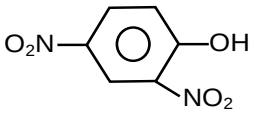
12. The ascending order of acidity of –OH group in the following compounds is :

(A) Bu – OH

(B) 

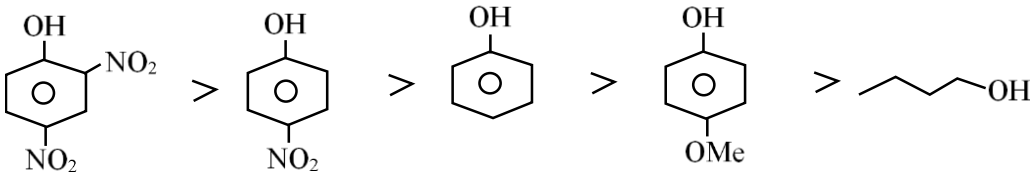
(C) 

(D) 

(E) 

Choose the correct answer from the option given below :
(1) (C) < (A) < (D) < (B) < (E) (2) (C) < (D) < (B) < (A) < (E)
(3) (A) < (D) < (C) < (B) < (E) (D) (A) < (C) < (D) < (B) < (E)

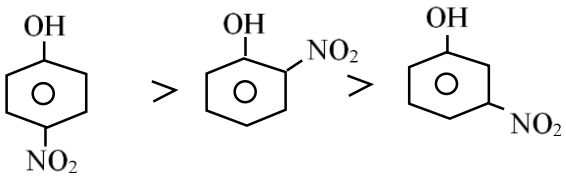
Ans. **4**



13. Given below are two statement :
Statement (I) : p-nitrophenol is more acidic than m-nitrophenol and o-nitrophenol.
Statement (II) : Ethanol will give immediate turbidity with Lucas reagent.
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 true
(2) Statement I is false but Statement II is true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

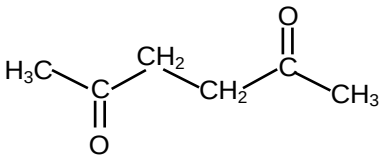
Ans. **3**

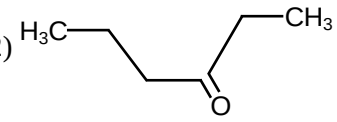
Acidic strength order

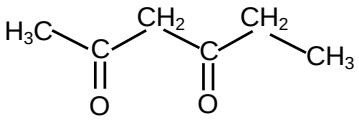


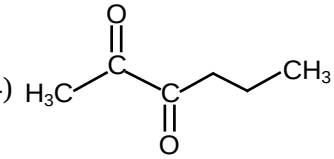
ethanol is 1°-alcohol, do not gives immediate turbidity with Lucas regent.

14. Which of the following has highly acidic hydrogen ?

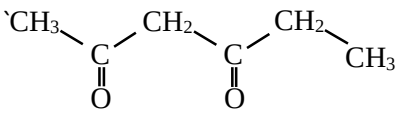
(1) 

(2) 

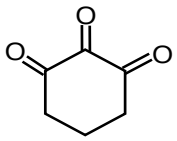
(3) 

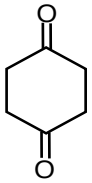
(4) 

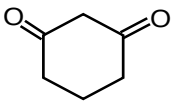
Ans. **3**

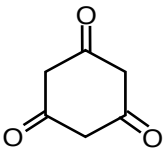


15. Highest enol content will be shown by :

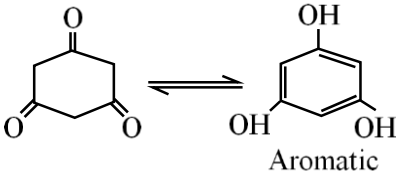
(1) 

(2) 

(3) 

(4) 

Ans. **4**



16. Which of the following electronic configuration would be associated with the highest magnetic moment ?

(1) [Ar] $3d^6$ (2) [Ar] $3d^7$ (3) [Ar] $3d^3$ (4) [Ar] $3d^8$

Ans. **1**

Highest magnetic means more number of unpaired e^-.

According to option answer is [Ar] $3d^6$

17. Element not showing variable oxidation state is :
(1) Chlorine (2) Iodine (3) Bromine (4) Fluorine

Ans. **4**
In halogen F does not exhibit variable oxidation state due to absence of vacant 'd' orbitals.

18. Given below are two statement : one is labelled as Assertion (A) and the other is labelled as Reason (R)
Assertion (A) : Melting point of Boron (2453 K) is unusually high in group 13 elements
Reason (R) : Solid Boron has very strong crystalline lattice.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(2) (A) is false but (R) is true
(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(4) (A) is true but (R) is false

Ans. **3**
Boron has Icosahedron (strong cystallinlattice) joint covalent structure hence its M. P is very high
So ans. Both R & A are correct & R is correct explanation of A

19. Yellow compound of lead chromate gets dissolved on treatment with hot NaOH solution. The product of lead formed is a :
(1) Tetraanionic complex with coordination number six
(2) Dianionic complex with coordination number six
(3) Neutral complex with coordination number four
(4) Dianionic complex with coordination number four

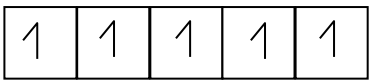
Ans. **4**

$$PbCrO_4 + NaOH \longrightarrow \underset{\text{Dianimic Eq. C.N.=4}}{Na_2[PbO_2]^{2-}} + Na_2[CrO_4]^{2-}$$

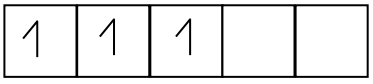
20. Consider the following complex ions
$P = [FeF_6]^{3-}$
$Q = [V(H_2O)_6]^{2+}$
$R = [Fe(H_2O)_6]^{2+}$
The correct order of the complex ions, according to their spin only magnetic moment values in (B.M.) is :
(1) R < Q < P (2) Q < R < P (3) R < P < Q (4) Q < P < R

Ans. **2**

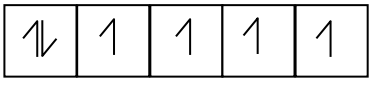
$P = [FeF_6]^{3-}$ $3d^5$



$Q = [V(H_2O)_6]^{2+}$ $3d^3$



$R = [Fe(H_2O)_6]^{2+}$ $3d^6$



SECTION – B

21. Among the following total number of meta directing functional group is _____.
(Integer based)
$-OCH_3$, $-NO_2$, –CN, $-CH_3$, $-NHCOCH_3$, –COR, –OH, – COOH, –Cl

Ans. **4**

– NO_2, –CN, –COR, –COOH are m-directing group.

22. The mass of silver (Molar mass of Ag : 108 $gmol^{-1}$) displaced by a quantity of electricity which displace 5600 mL of O_2 at S.T.P will be _____ g.

Ans. **108**

moles of $O_2 = \frac{5600}{22400} = 0.25$

eq of $O_2 = 0.25 \times 4 = 1$

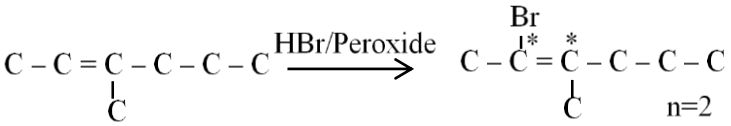
eq of Ag = 1

moles of Ag = 1

moss of Ag = 108g

23. 3-Methylhex-2-ene on reaction with HBr in presence of peroxide forms an addition product (A). The number of possible stereoisomers for 'A' is _____ .

Ans. **4**



Possible stereo isomer = $2^2 = 4$

24. Sum of bond order of CO and NO^+ is _____.

Ans. **6**

B.O. of CO = 3 [C ⇇ O]

B.O. of NO^+ = 3 [N ≡ O+]

Total sum = 6

25. From the given list, the number of compounds with +4 oxidation state of Sulphur is _____ .
SO_3, H_2SO_3, $SOCl_2$, SF_4, $BaSO_4$, $H_2S_2O_7$

Ans. **3**

$H_2SO_3 \Rightarrow +4$

$SOCl_2 \Rightarrow +4$

$SF_4 \Rightarrow +4$

$SO_3 \Rightarrow +6$

$H_2S_2O_7 = +6$

26. The number of electrons present in all the completely filled subshells having n = 4 and S = $+\frac{1}{2}$ is _____.

Ans. **16**

n = 4 = 4S	4p	4d	4f
½S = 1	3	5	7

= 16 e^-

27. Mass of methane required to produce 22g of CO_2 after complete combustion is _____ g.
(Given Molar mass in g mol^{-1} C = 12.0
H = 1.0
O = 16.0)

Ans. **8**

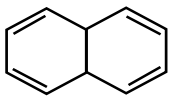
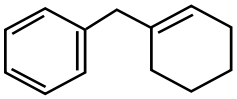
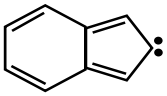
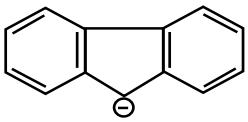
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

22g

$= \frac{1}{2}$ $= \frac{22}{44}$

$= \frac{1}{2}$ moles $\Rightarrow$ 8 gm

28. Among the given organic compounds, the total number of aromatic compounds is _____ .

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

Ans. **3**

Fact

29. If three moles of an ideal gas at 300 k expand isothermally from 30 dm^3 to 45 dm^3 against a constant opposing pressure of 80 kPa, then the amount of heat transferred is _____ J .

Ans. 1200

$W = - P_2 (V_2 - V_1)$

$= - 80 (45 - 30) = - 1200$ J

$Q = -w$

$Q = 1200$ J

30. Consider the following data for the given reaction

$2 HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$

	1	2	3
HI (mol L^{-1})	0.005	0.01	0.02
Rate (mol L^{-1} S^{-1})	7.5×10^{-4}	3.0×10^{-3}	1.2×10^{-2}

The order of the reaction is _____.

Ans. **2**

$r \alpha [HI]^x$

From (1) & (2) data

$$\frac{(7\times10^{-4})}{(3\times10^{-3})} = \left[\frac{(5\times10^{-3})}{(1\times10^{-2}}\right]^x$$

x = 2

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MOTION

Revised