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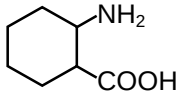
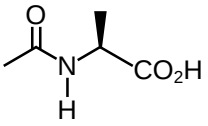
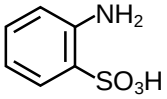
JEE Main - 2018 (CBT)
Exam Test Date: 15/04/2018
Test Time: 9:30 AM - 12:30 PM
Set - II

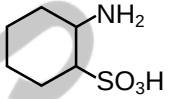
Part - B(Chemistry)

1. Which of the following will not exist in zwitter ionic form at pH = 7 ?

(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. The N atom of amide is not basic.

2. A sample of $NaClO_3$ is converted by heat to NaCl with a loss of 0.16 g of oxygen. The residue is dissolved in water and precipitated as AgCl. The mass of AgCl (in g) obtained will be : (Given: Molar mass of AgCl = 143.5 g mol^{-1})

(1) 0.35 (2) 0.54 (3) 0.41 (4) 0.48

Ans. (4)

Sol. $2NaClO_3 \xrightarrow{\Delta} 2NaCl + 3O_2$

0.16 g

$$\frac{n_{NaCl}}{2} = \frac{n_{O_2}}{3}$$

$$n_{NaCl} = \frac{0.16}{32} \times \frac{2}{3} = \frac{1}{200} \times \frac{2}{3} = \frac{1}{300}$$

$NaCl \longrightarrow AgCl$

POAC of Cl

$1 \times n_{NaCl} = 1 \times n_{AgCl}$

$$\frac{1}{300} = n_{AgCl}$$

$$\text{Weight of AgCl} = \frac{1}{300} \times [108 + 35.5] = \frac{1}{300} \times 143.5$$

$= 0.48$ g

3. For which of the following reactions, ΔH is equal to ΔU ?

(1) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ (2) $2HI(g) \rightarrow H_2(g) + I_2(g)$

(3) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ (4) $2NO_2(g) \rightarrow N_2O_4(g)$

Ans. (2)

Sol. $\Delta H = \Delta U + \Delta n_g RT$

$2HI(g) \rightarrow H_2(g) + I_2(g)$ $\Delta n_g = (1 + 1) - 2 = 0$

4. N_2O_5 decomposes to NO_2 and O_2 and follows first order kinetics. After 50 minutes, the pressure inside the vessel increases from 50 mm Hg to 87.5 mm Hg. The pressure of the gaseous mixture after 100 minute at constant temperature will be :

(1) 136.25 mm Hg (2) 106.25 mm Hg (3) 175.0 mm Hg (4) 116.25 mm Hg

Ans. (2)

Sol. $N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2$

t = 0	50	0	0
t = 50 min.	$50-p_1$	$2p_1$	$\frac{p_1}{2}$
	$= 25$		
t = 100 min.	$50 - p_2$	$2p_2$	$\frac{p_2}{2}$
	$= 12.5$		

$$50 - p_1 + 2p_1 + \frac{p_1}{2} = 87.5$$

$$50 + \frac{3p_1}{2} = 87.5$$

$$\frac{3p_1}{2} = 37.5$$

$$p_1 = \frac{37.5 \times 2}{3} = 25$$

50 minute is half life period

for 100 minute (2 half life)

$$50 - p_2 = 12.5$$

$p_2 = 37.5$ mm of Hg

Total pressure at 100 minute

$$= 50 - p_2 + 2p_2 + \frac{p_2}{2}$$

$$= 50 + \frac{3p_2}{2} = 50 + \frac{3}{2} \times 37.5$$

$$= 50 + 56.25$$

$$= 106.25 \text{ mm of Hg}$$

5. In the molecular orbital diagram for the molecular ion, N_2^+, the number of electrons in the σ_{2p} molecular orbital is :

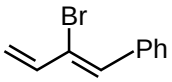
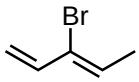
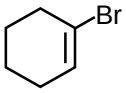
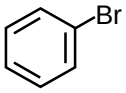
(1) 0 (2) 2 (3) 3 (4) 1

Ans. (4)

Sol. $N_2^+ \rightarrow \sigma_{1s^2}, \sigma^*_{1s^2}, \sigma_{2s^2}, \sigma^*_{2s^2}, [\pi^2_{2p_x} = \pi^2_{2p_y}]\sigma^1_{2p_z}$

Number of electron in σ_{2p_z} is 1

6. Which of the following will most readily give the dehydrohalogenation product ?

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

Ans. (1)

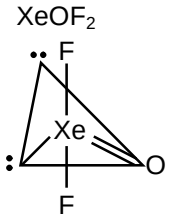
Sol. Here dehydrohalogenation goes by E1cb and most stable carbanion formation is favoured in A.

7. Identify the pair in which the geometry of the species is T-shape and square-pyramidal, respectively :

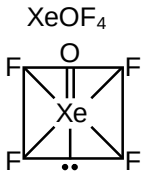
(1) ICl_2^- and ICl_5 (2) IO_3^- and $IO_2F_2^-$ (3) ClF_3 and IO_4^- (4) $XeOF_2$ and $XeOF_4$

Ans. (4)

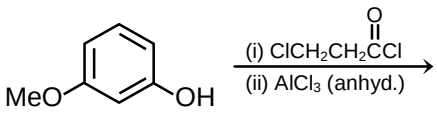
Sol.

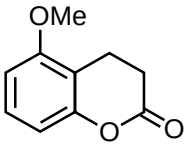
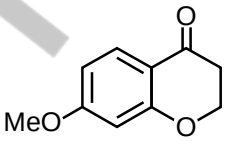


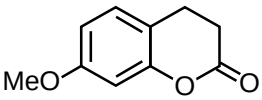
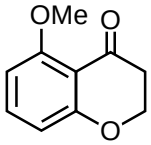
T-Shape



8. The major product of the following reaction is :

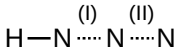


(1)  (2) 

(3)  (4) 

Ans. (2)

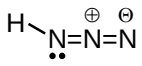
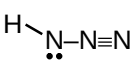
Sol. The reactant undergoes acylation first followed by substitution Intramolecular.

9. 

In hydrogen azide (above) the bond orders of bonds (I) and (II) are :

	(I)	(II)		(I)	(II)
(1)	< 2	> 2	(2)	> 2	> 2
(3)	> 2	< 2	(4)	< 2	< 2

Ans. (1)

Sol.  or 

10. For Na^+, Mg^{2+}, F^- and O^{2-} ; the correct order of increasing ionic radii is :

(1) $O^{2-} < F^- < Na^+ < Mg^{2+}$ (2) $Na^+ < Mg^{2+} < F^- < O^{2-}$

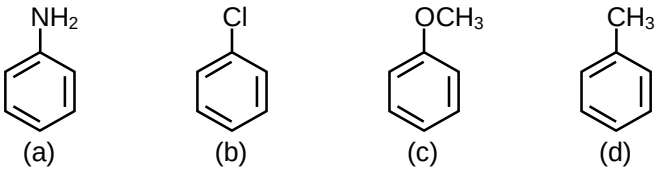
(3) $Mg^{2+} < Na^+ < F^- < O^{2-}$ (4) $Mg^{2+} < O^{2-} < Na^+ < F^-$

Ans. (3)

Sol. Isoelectronic series : $Mg^{2+} < Na^+ < F^- < O^{2-}$

When negative charge increase, increase the radius of ion.

11. The increasing order of nitration of the following compounds is :



(a) (b) (c) (d)

(1) (a) < (b) < (d) < (c) (2) (a) < (b) < (c) < (d)

(3) (b) < (a) < (c) < (d) (4) (b) < (a) < (d) < (c)

Ans. (1)

Sol. Here the aniline is the least reactive due to formation of anilinium ion in acidic medium.

12. The correct match between items of List-I and List-II is :

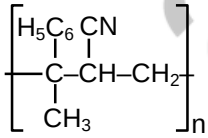
	List-I		List-II
(A)	Coloured impurity	(P)	Steam distillation
(B)	Mixture of o-nitrophenol and p-nitrophenol	(Q)	Fractional distillation
(C)	Crude Naphtha	(R)	Charcoal treatment
(D)	Mixture of glycerol and sugars	(S)	Distillation under reduced pressure

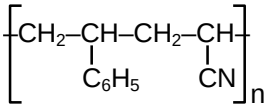
(1) (A)-(R), (B)-(S), (C)-(P), (D)-(Q) (2) (A)-(P), (B)-(S), (C)-(R), (D)-(Q)

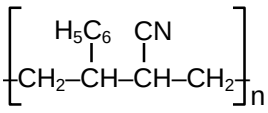
(3) (A)-(R), (B)-(P), (C)-(Q), (D)-(S) (4) (A)-(R), (B)-(P), (C)-(S), (D)-(Q)

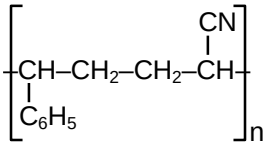
Ans. (3)

13. The copolymer formed by addition polymerization of styrene and acrylonitrile in the presence of peroxide is :

(1) 

(2) 

(3) 

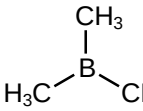
(4) 

Ans. (2)

14. Which of the following is a Lewis acid ?

(1) PH_3 (2) NF_3 (3) NaH (4) $B(CH_3)_3$

Ans. (4)

Sol.  $(6e^-)$ (Lewis Acid)

15. Which of the following statements about colloids is **False** ?

(1) When silver nitrate solution is added to potassium iodide solution a negatively charged colloidal solution is formed.

(2) Freezing point of colloidal solution is lower than true solution at same concentration of a solute.

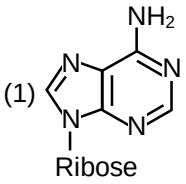
(3) Colloidal particles can pass through ordinary filter paper.

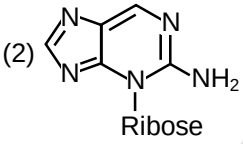
(4) When excess of electrolyte is added to colloidal solution, colloidal particle will be precipitated.

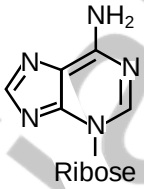
Ans. (2)

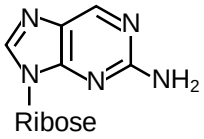
Sol. Freezing point of colloidal solution is higher than true solution at same concentration of a solute.

16. Which of the following is the correct structure of Adenosine ?

(1) 

(2) 

(3) 

(4) 

Ans. (1)

17. The correct combination is :

(1) $[NiCl_4]^{2-}$ – square-planar ; $[Ni(CN)_4]^{2-}$ – paramagnetic

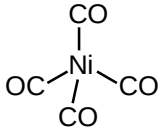
(2) $[Ni(CN)_4]^{2-}$ – tetrahedral ; $[Ni(CO)_4]^{2-}$ – paramagnetic

(3) $[NiCl_4]^{2-}$ – paramagnetic ; $[Ni(CO)_4]$ – tetrahedral

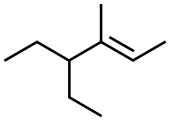
(4) $[NiCl_4]^{2-}$ – diamagnetic ; $[Ni(CO)_4]$ – square-planar

Ans. (3)

Sol.

$[NiCl_4]^{2-}$	$[Ni(CO)_4]$
sp^3	sp^3
Paramagnetic (2 unpaired electron)	
$Ni^{2+} \rightarrow [Ar]3d^8, 4s^0, 4p^0$	$Ni(O) \rightarrow [Ar]3d^8, 4s^2, 4p^0$
Cl^- (W.F.L.) (No pairing)	CO is S.F.L. [Ar] $3d^{10}$ $\underbrace{4s^0, 4p^0}_{sp^3}$ (Tetrahedral)

18. The IUPAC name of the following compound is :

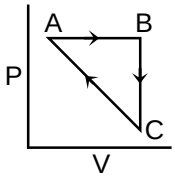


(1) 3-ethyl-4-methylhex-4-ene (2) 4,4-diethyl-3-methylbut-2-ene

(3) 4-methyl-3-ethylhex-4-ene (4) 4-ethyl-3-methylhex-2-ene

Ans. (4)

19. An ideal gas undergoes a cyclic process as shown in Figure.



$\Delta U_{BC} = -5$ kJ mol^{-1}, $q_{AB} = 2$ kJ mol^{-1}

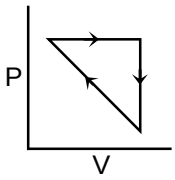
$W_{AB} = -5$ kJ mol^{-1}, $W_{CA} = 3$ kJ mol^{-1}

Heat absorbed by the system during process CA is :

(1) – 5 kJ mol^{-1} (2) + 5 kJ mol^{-1} (3) 18 kJ mol^{-1} (4) – 18 kJ mol^{-1}

Ans. (2)

Sol.



AB $\rightarrow$ isobaric

BC $\rightarrow$ Isochoric

CA $\rightarrow$ not defined

$\Delta U_{AB} = q + W$

$= 2 - 5 = -3$

$\Delta U_{ABC} = \Delta U_{AB} + \Delta U_{BC}$

$= -3 - 5 = -8$ kJ

$\Delta U_{CBA} = +8$

$= Q + W$

$8 = Q + 3$

$Q = +5$ kJ

20. Ejection of the photoelectron from metal in the photoelectric effect experiment can by stopped by applying 0.5 V when the radiation of 250 nm is used. The work function of the metal is :

(1) 4 eV (2) 5.5 eV (3) 4.5 eV (4) 5 eV

Ans. (3)

Sol. $\lambda = 250 \text{ nm} = 2500 \text{ Å}$

$$E = \frac{hc}{\lambda} = \frac{12400}{2500} = 4.96 \text{ eV}$$

KE = stopping potential = 0.5 eV

$E = W_0 + K.E.$

$4.96 = W + 0.5$

$W_0 = 4.46 \approx 4.5 \text{ eV}$

21. In graphite and diamond, the percentage of p-characters of the hybrid orbitals in hybridization are respectively :

(1) 33 and 25 (2) 67 and 75 (3) 50 and 75 (4) 33 and 75

Ans. (2)

Sol.

Graphite	Diamond
sp^2 hybridisation	sp^3 hybridisation
$\% P = \frac{2}{3} \times 100 = 67\ \%$	$\% P = \frac{3}{4} \times 100 = 75\ \%$

22. When an electric current is passed through acidified water, 112 mL of hydrogen gas at N.T.P was collected at the cathode in 965 seconds. The current passed, in ampere, is :

(1) 2.0 (2) 0.1 (3) 0.5 (4) 1.0

Ans. (4)

Sol. Cathode

$$2e^- + 2H_2O \longrightarrow H_2 + 2OH^- \qquad (v.f.)_{H_2} = 2$$

$$\text{mole} = \frac{i \times t}{\text{v.f.} \times 96500}$$

$$\frac{112}{22400} = \frac{i \times 965}{2 \times 96500}$$

$$\frac{1}{2} = \frac{i}{2}$$

i = 1 amp

23. The minimum volume of water required to dissolve 0.1 g lead(II) chloride to get a saturated solution (K_{sp} of $PbCl_2 = 3.2 \times 10^{-8}$; atomic mass of Pb = 207 u) is :

(1) 1.798 L (2) 0.36 L (3) 17.95 L (4) 0.18 L

Ans. (4)

Sol. $(K_{sp})_{PbCl_2} = 32 \times 10^{-9}$

$PbCl_2 \rightleftharpoons Pb^{2+} + 2Cl^-$

$s \quad 2s$

$K_{sp} = [Pb^{2+}][Cl^-]^2$

$K_{sp} = 4s^3 = 32 \times 10^{-9}$

$s^3 = 8 \times 10^{-9}$

$s = 2 \times 10^{-3}$ M

$\frac{w}{M.w.} \times \frac{1}{V_L} = 2 \times 10^{-3}$

$\frac{0.1}{278} \times \frac{1}{V_L} = 2 \times 10^{-3}$

$V_L = \frac{0.1 \times 1000}{278 \times 2} = 0.18$ L

24. In which of the following reactions, an increase in the volume of the container will favour the formation of products ?

(1) $4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(\ell)$

(2) $2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$

(3) $3O_2(g) \rightleftharpoons 2O_3(g)$

(4) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

Ans. (2)

Sol. Volume ↑ P ↓ reaction proceed in which direction where number of gases mole increases.

$2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g) \qquad \Delta n_g = (2 + 1) - 2 = 1$

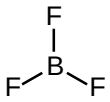
25. The decreasing order of bond angles in BF_3, NH_3, PF_3 and I_3^- is :

(1) $I_3^- > BF_3 > NH_3 > PF_3$ (2) $BF_3 > I_3^- > PF_3 > NH_3$

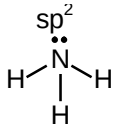
(3) $BF_3 > NH_3 > PF_3 > I_3^-$ (4) $I_3^- > NH_3 > PF_3 > BF_3$

Ans. (1)

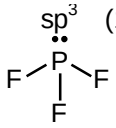
Sol.



Bond angle = 120º

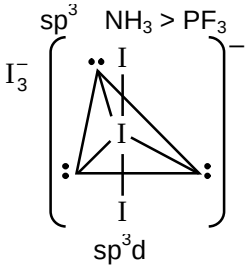


Bond angle = 107º



(1 lone pair)

When central atom size ↑
Bond angle ↓

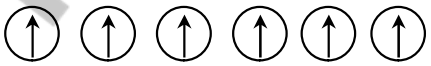


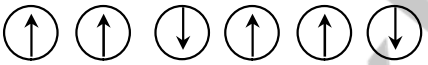
$NH_3 > PF_3$

Bond angle 180º

Bond Angle $PF_3 < NH_3 < BF_3 < I_3^-$

26. Which of the following arrangements shows the schematic alignment of magnetic moments of antiferromagnetic substance ?

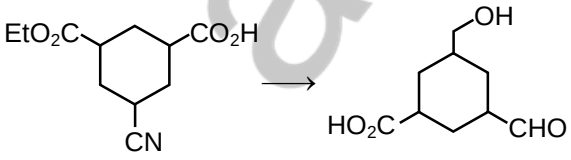
(1)  (2) 

(3)  (4) 

Ans. (4)

Sol. Substances which are expected to possess para-magnetism or ferro-magnetism on the basis of unpaired electrons but actually they possess zero net magnetic moment are called anti ferromagnetic substance.

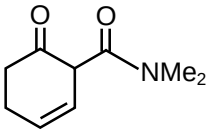
27. The reagent(s) required for the following conversion are :

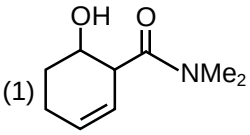


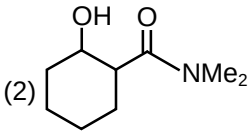
(1) (i) $NaBH_4$ (ii) Raney Ni/H_2 (iii) H_3O^+ (2) (i) $LiAlH_4$ (ii) H_3O^+

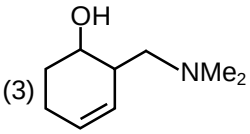
(3) (i) B_2H_6 (ii) DIBAL-H (iii) H_3O^+ (4) (i) B_2H_6 (ii) $SnCl_2/HCl$ (iii) H_3O^+

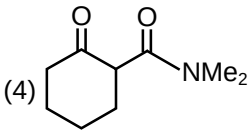
28. The main reduction product of the following compound with $NaBH_4$ in methanol is :



(1) 

(2) 

(3) 

(4) 

Ans. (1)

29. Xenon hexafluoride on partial hydrolysis produces compounds 'X' and 'Y'. Compounds 'X' and 'Y' and the oxidation state of Xe are respectively :

(1) $XeOF_4$ (+6) and XeO_3 (+6) (2) $XeOF_2$ (+4) and XeO_3 (+6)

(3) $XeOF_4$ (+6) and XeO_2F_2 (+6) (4) XeO_2F_2 (+6) and XeO_2 (+4)

Ans. (3)

Sol. $XeF_6 + H_2O \xrightarrow[\text{hydrolysis}]{\text{Partial}} \overset{+6}{XeOF_4}$

$XeF_6 + H_2O \xrightarrow[\text{hydrolysis}]{\text{Partial}} \overset{+6}{XeO_2F_2}$

30. A white sodium salt dissolves readily in water to give a solution which is neutral to litmus. When silver nitrate solution is added to the aforementioned solution, a white precipitate is obtained which does not dissolve in dilute nitric acid. The anion is :

(1) CO_3^{2-} (2) SO_4^{2-} (3) S^{2-} (4) Cl^-

Ans. (4)

Sol. $Cl^- + Na^+ \longrightarrow \underset{\text{(Neutral)}}{NaCl}$ (SASB salt) $\xrightarrow{AgNO_3}$ AgCl (white ppt) (not dissolve in dilute HNO_3)