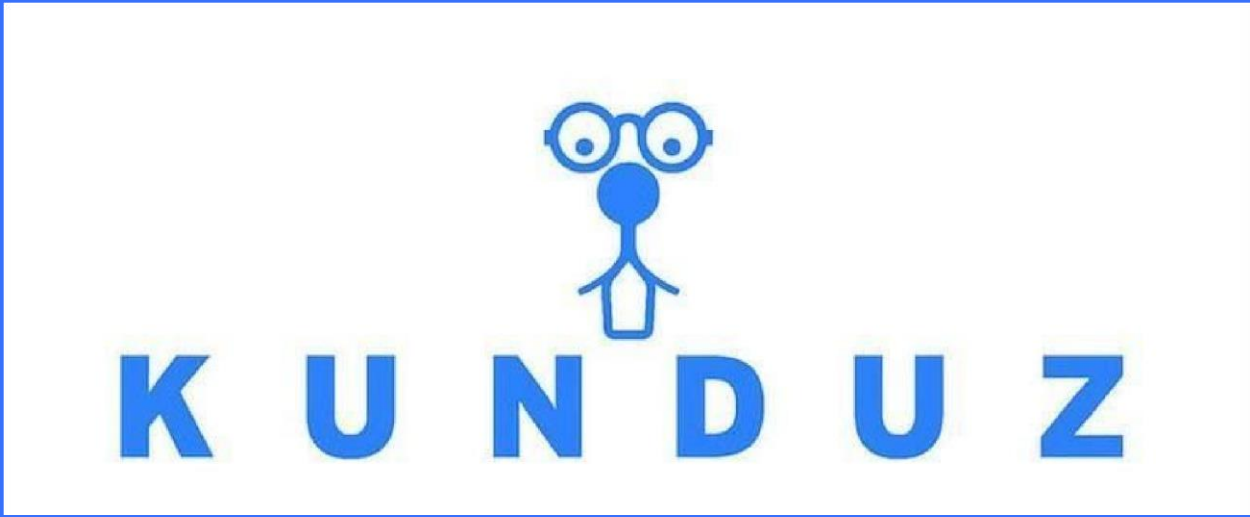

JEE Mains 3rd September 2020 shift 2 Chemistry solutions prepared by KUNDUZ tutors

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Question number

Question and Answers

1

JEE - Mains.
3rd September Shift-2.
Chemistry.

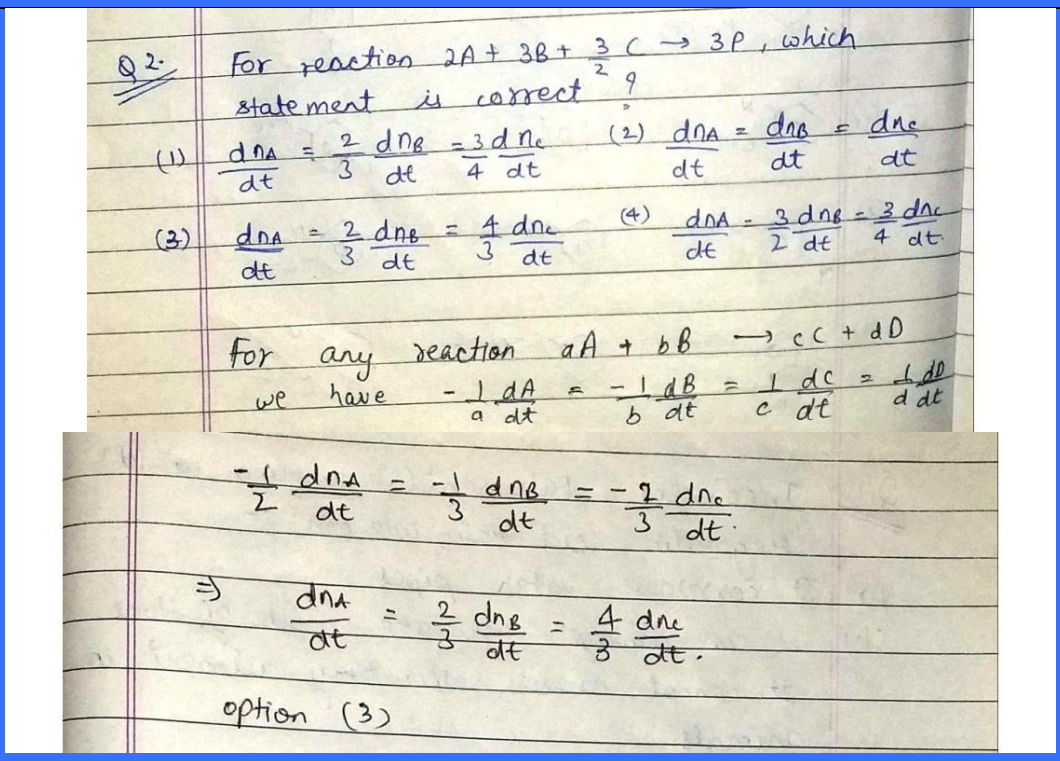
Q.1. Incorrect statement(s) among (a)-(d) regarding acid rain are (is) :-

(a) It corrodes water pipes
(b) It can damage structure made of stone
(c) It cannot cause respiratory ailment in animals.
(d) It is not harmful to trees.

(i) (a), (c) & (d) (ii) (c) and (d)
(iii) (a), (b) & (d) (iv) (c) only

Acid rains cause leaching of metals like Fe, Pb into drinking water by corroding pipes. It damages stone building ex. Taj Mahal. SO_2 and CO_2 dissolved causes respiratory ailments in animals. It is also harmful for tree leaves. It damages crops so option (ii) is correct.

2



Q.2. For reaction $2A + 3B + \frac{3}{2}C \rightarrow 3P$, which statement is correct ?

(1) $\frac{dn_A}{dt} = \frac{2}{3}\frac{dn_B}{dt} = \frac{3}{4}\frac{dn_C}{dt}$

(2) $\frac{dn_A}{dt} = \frac{dn_B}{dt} = \frac{dn_C}{dt}$

(3) $\frac{dn_A}{dt} = \frac{2}{3}\frac{dn_B}{dt} = \frac{4}{3}\frac{dn_C}{dt}$

(4) $\frac{dn_A}{dt} = \frac{3}{2}\frac{dn_B}{dt} = \frac{3}{4}\frac{dn_C}{dt}$

For any reaction $aA + bB \longrightarrow cC + dD$

we have $-\frac{1}{a}\frac{dA}{dt} = -\frac{1}{b}\frac{dB}{dt} = \frac{1}{c}\frac{dC}{dt} = \frac{1}{d}\frac{dD}{dt}$

$$-\frac{1}{2}\frac{dn_A}{dt} = -\frac{1}{3}\frac{dn_B}{dt} = -\frac{1}{3}\frac{dn_C}{dt}$$

$$\Rightarrow \frac{dn_A}{dt} = \frac{2}{3}\frac{dn_B}{dt} = \frac{4}{3}\frac{dn_C}{dt}$$

option (3)

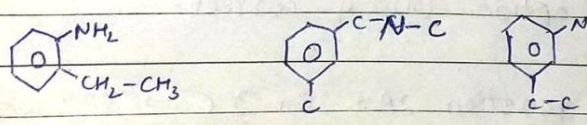
3

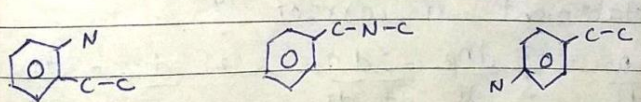
Q.3 Three isomers A, B and C (mol. formula $(C_8H_{11}N)$ gives following results :

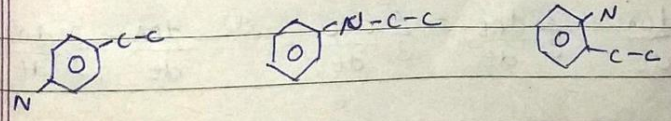
A and C $\xrightarrow{\text{Diazotisation}}$ P + Q $\xrightarrow[\text{(ii) oxidation } (KMnO_4 + H^+)]{\text{(i) Hydrolysis}}$ R (from A) + S (from C)

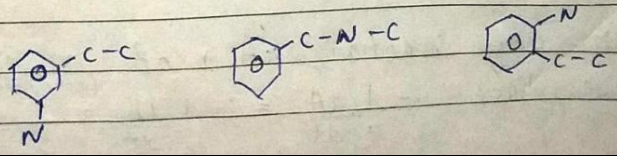
R has lower boiling point than S.

B $\xrightarrow{C_6H_5SO_2Cl}$ alkali-insoluble product A, B and C are :-

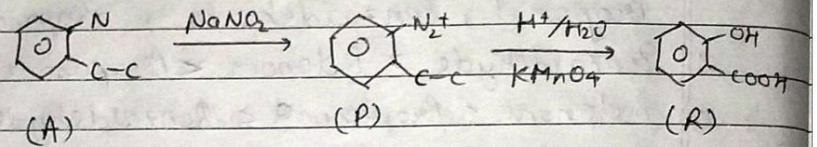
(1) 

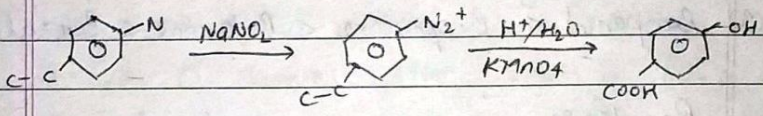
(2) 

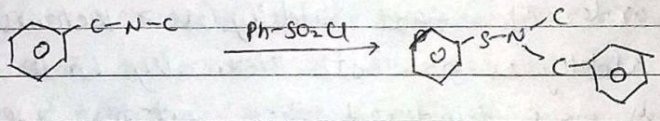
(3) 

(4) 

This question can only be done by checking all options. For option 2.







not soluble in Aq. NaOH

(R) has intramolecular H-bonding and (S) has intermolecular so R has lower boiling point than (S). So 2 is correct.

4

Q.4. The five successive ionisation enthalpies of an element are 800, 2427, 3658, 35024 and 32824 kJ mol^{-1}. The no. of valence e^- in element is ?

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

From above values we find a large jump from 3658 to 35024 it means after removing 3 e^-'s next is removed from stable full inner shell so no of valence e^- are 3 i.e. option (2).

5

5 The increasing order of the reactivity of the following compounds in nucleophile addition reaction is :

Propanal , Benzaldehyde , Propanone , Butanone

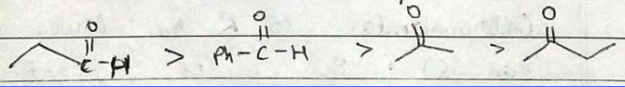
(1) Benzaldehyde > Butanone > Propanone > Propanal

(2) Butanone < Propanone < Benzaldehyde < Propanal

(3) Benzaldehyde < Propanal < Propanone < Butanone

(4) Propanal < Propanone < Butanone < Benzaldehyde

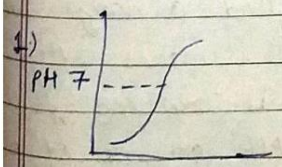
Reactivity of various carbonyl compounds toward nucleophilic addition reaction follows order of that aldehydes > ketones . as aldehydes are not sterically hindered . Ph-CHO is more hindered than ~~ketone~~ Propanal . and b/w propanone and butanone butanone is more hindered so option (2)



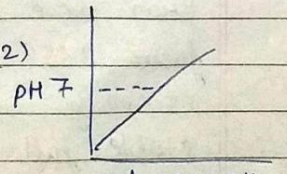
6

6. 100 ml of 0.1 M HCl is taken in a beaker and to it 100 ml of 0.1 M NaOH is added in steps of 2ml and the pH is continously measured. Which of the following graphs correctly depicts the change in pH?

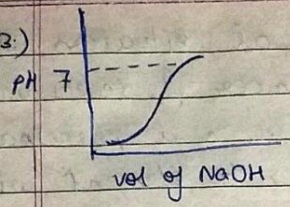
1)



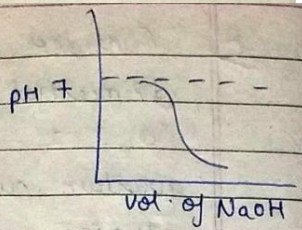
(2)



3)



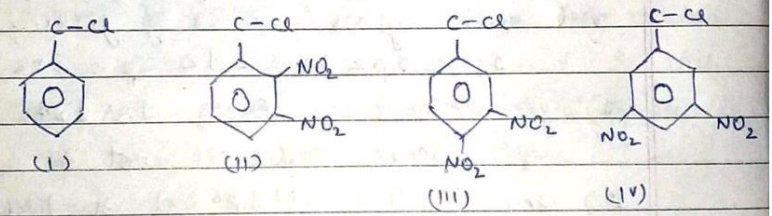
4)



Whenever their is titration of strong acid and strong base pH always rise very sharply near equivalence point. Graph 1 denotes steep rise in pH near pH 7 so it is correct - option 1.

7

Q 7. The decreasing order of reactivity of the following compounds towards nucleophilic substitution reaction (S_N2) is :



1.) (II) > III > I > IV
2.) II > III > IV > I
3.) III > II > IV > I
4.) IV > II > III > I

-M and -I group increases rate of S_N2.
rate of S_N2 reaction depends on -M and -I group. (I) → do not have any -M or -I
(II) → has strong -I and -M.
(III) → has less strong -I and -M than (II)
(IV) → only has -I

So order is II > III > IV > I
option 2.

8

8. Consider the hypothetical situation where azimuthal quantum number l, takes values $0, 1, 2 \ldots\ldots n+1$, where n is principal quantum number. Then, the element with atomic no

1.) 6 has a 2p - valence shell sub.
2.) 9 is the first alkali metal.
3.) 8 is the first noble gas
4.) 13 has a half-filled valence subshell.

according to the new rule given in question
$n=1$ will have $l = 0, 1, 2$
$n=2$ will have $l = 0, 1, 2, 3$
and so on. Also for filling electrons $n+l$ rule gives order of filling as

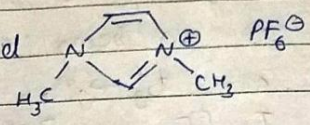
$$1s < 1p < 2s < 1d < 2p < 3s < 2d \ldots\ldots$$

1) for atomic no 6 $\Rightarrow$ $1s^2 1p^4$ has 1 p valence subshell not 2.
2.) for $Z = 9 \Rightarrow 1s^2 1p^6 2s^1$ is first alkali metal so (2) is correct.
3.) for $Z = 8 \Rightarrow 1s^2 1p^6$ is first noble gas as its outer shell 1p is complete
4.) for $Z = 13 \Rightarrow 1s^2 1p^6 2s^2 1d^3$ is not half filled as d will have 5 orbitals.

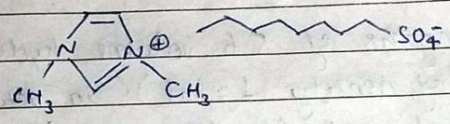
so both 2 and 3 are correct.

9

9. An ionic micelle is formed on addition of.

1) excess water to liquid 

2.) liquid diethyl ether to aqueous NaCl solution

3.) excess water to liquid 

4.) Sodium stearate to pure toulene.

If we look at 3 then it has long carbon chain with anionic group at end so this chain can form hydrophobic part of micelle with SO_4^- at their end. Hence 3 is correct choice.

10

10.) d-Electron configuration of $[Ru(en)_3]Cl_2$ and $[Fe(H_2O)_6]Cl_2$, respectively are :-

1.) $t_{2g}^6 e_g^0$ and $t_{2g}^4 e_g^2$ 2.) $t_{2g}^4 e_g^2$ and $t_{2g}^4 e_g^2$

3.) $t_{2g}^6 e_g^0$ and $t_{2g}^6 e_g^0$ 4.) $t_{2g}^4 e_g^2$ and $t_{2g}^6 e_g^0$

Ru comes from 4-d series its octahedral complex because en has denticity of 2.

also en has charge of 0 so Ru has charge of +2 hence $Ru^{2+} = [Kr]4d^6 5s^0$ as en being strong ligand filling is done as $t_{2g}^6 e_g^0$.

In $[Fe(H_2O)_6]Cl_2$ Fe has +2 charge $Fe^{+2} = [Ar]3d^6 4s^0$ as H_2O is weak field ligand fillings occur as $t_{2g}^4 e_g^2$.

option 1 is correct.

11

11. The strengths of 5.6 volume hydrogen peroxide (of density 1 g/ml) in terms of mass % and molarity (M) respectively are: (Take molar mass of H_2O_2 as 34 g/mol).

(1) 1.7 and 0.5 (2) 0.85 and 0.5

(3) 1.7 and 0.25 (4) 0.85 and 0.25

Particularly for H_2O_2

Volume strength = 11.2 × molarity

$\Rightarrow$ molarity = 5.6 / 11.2 = 0.5

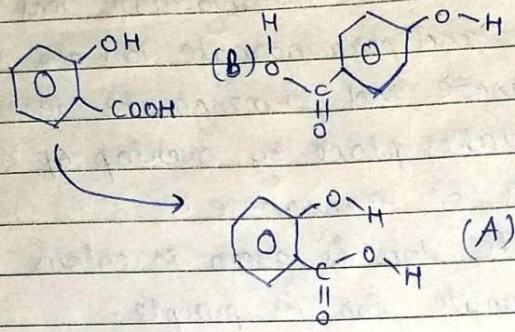
For each 1 l solution (whose density given 1 g/ml) its mass = 1000 g. and mass of H_2O_2 in this solution is 0.5 × molar mass of H_2O_2 $\Rightarrow$ 0.5 × 34 = 17

so $\frac{17}{1000} \times 100 = 1.7\%$ mass of H_2O_2

option 1 is correct.

12

12. Consider the following molecules and statements related to them:

(A) 

(A)

(a) (B) is more likely to be crystalline than (A)

(b) (B) has higher boiling point than (A)

(c) (B) dissolves more readily than (A) in water

Identify options from below

(1) only (a) is true (2) (a) and (b) are true

(3) (b) and (c) are true (4) (a) and (c) are true

See A will have intramolecular H-bonding & (B) will have intermolecular H-bonding. So B will be more crystalline also because it will pack efficiently due to para position of groups. B will have higher b.p. due to inter-H-bonding B will also more soluble as it can coordially form H-bonds with water molecules so 2, 3, 4 are correct options as a, b, c are correct statements.

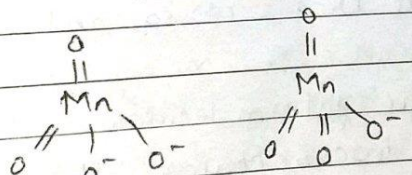
13

13) The incorrect statement is :-

1.) Manganate and Permanganate ions are tetrahedral
2.) Manganate and permanganate ions are paramagnetic
3.) In manganate and permanganate ions, the π-bonding takes place by overlap of oxygen and d-orbitals of manganese
4.) Manganate ion is green in colour and permanganate ion is purple.

This is an advanced level question. as it requires so many things to learn.

Manganate ion → MnO_4^{2-}, , green
Permanganate ion → MnO_4^- , purple



both are tetrahedral

option 3 is also correct.
2 is incorrect as manganate having 1 upe- is paramagnetic whereas permanganate is diamagnetic. so option 2.

14

Q.14 A complex 'A' has a composition of $H_{12}O_6Cl_3Cr$. If the complex on treatement with conc. H_2SO_4 loses 13.5 % of its original mass, correct molecular formula of A is : [atomic mass of Cr = 52 amu, atomic mass of Cl = 35 amu]

(1) $[Cr(H_2O_6)]Cl_3$ (2) $[Cr(H_2O)_4Cl_2]Cl\cdot 2H_2O$

(3) $[Cr(H_2O)_3Cl_3]\cdot 3H_2O$ (4) $[Cr(H_2O)_5Cl]Cl_2\cdot H_2O$

Total molecular mass of complex is $(12\times1 + 6\times16 + 35\times3 + 52)$

So $\frac{\text{mass lost}}{\text{Total mass}} \times 100 = 13.5$

$\Rightarrow$ mass lost $= \frac{13.5}{100} \times (12 + 6\times16 + 35\times3 + 52)$

≈ 36.

now if conc. H_2SO_4 is used it acts as dehydrating agent so it must have taken (2×18) g mass i.e. 2 H_2O molecules. so option (2) gives correct formula.

15

Q.15. A mixture of one mole each of H_2, He and O_2 are enclosed in a cylinder of volume V at temp. T. If partial pressure of H_2 is 2 atm. total pressure of gases in cylinder is :

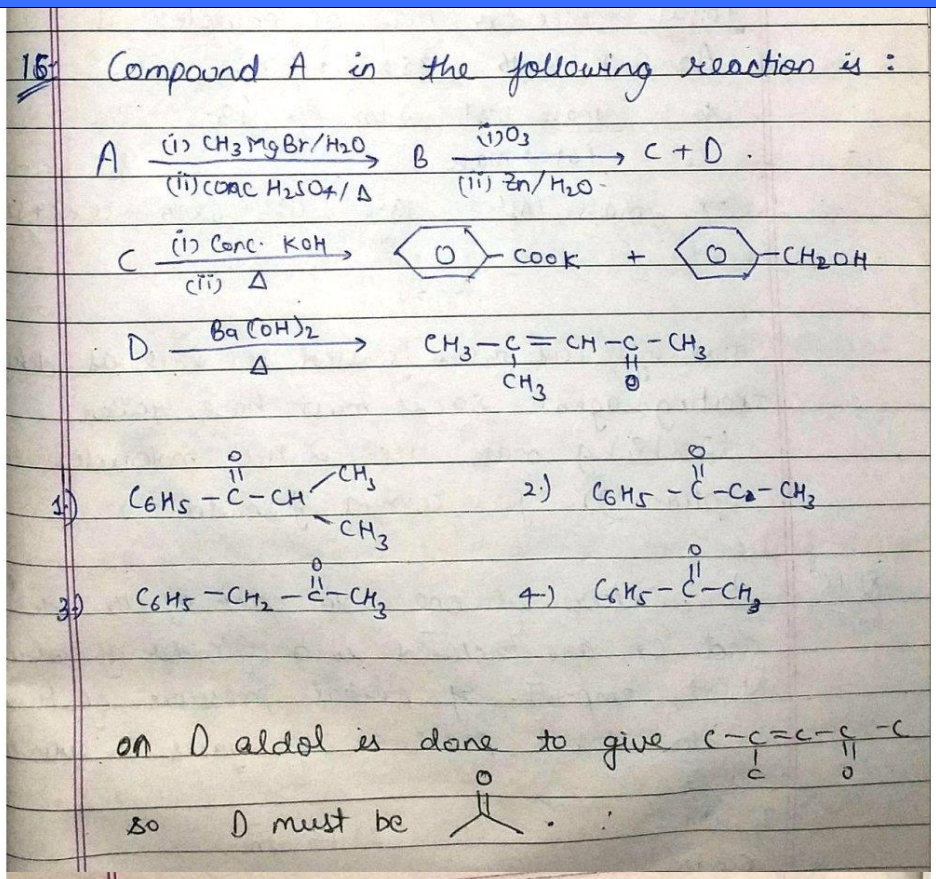
1) 22 atm
2) 14 atm
3) 6 atm
4) 38 atm

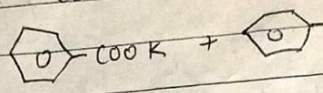
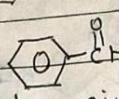
Always remember that partial pressure of a component of mixture of gases only depend on no. of moles of the component present. as all H_2, He and O_2 has 2 moles each so pressure due to He and O_2 will equal that due to H_2 i.e. 2 atm so

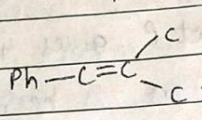
Total pressure = Sum of pressure due to all components

= 2+2+2 = 6 atm option 3.

16

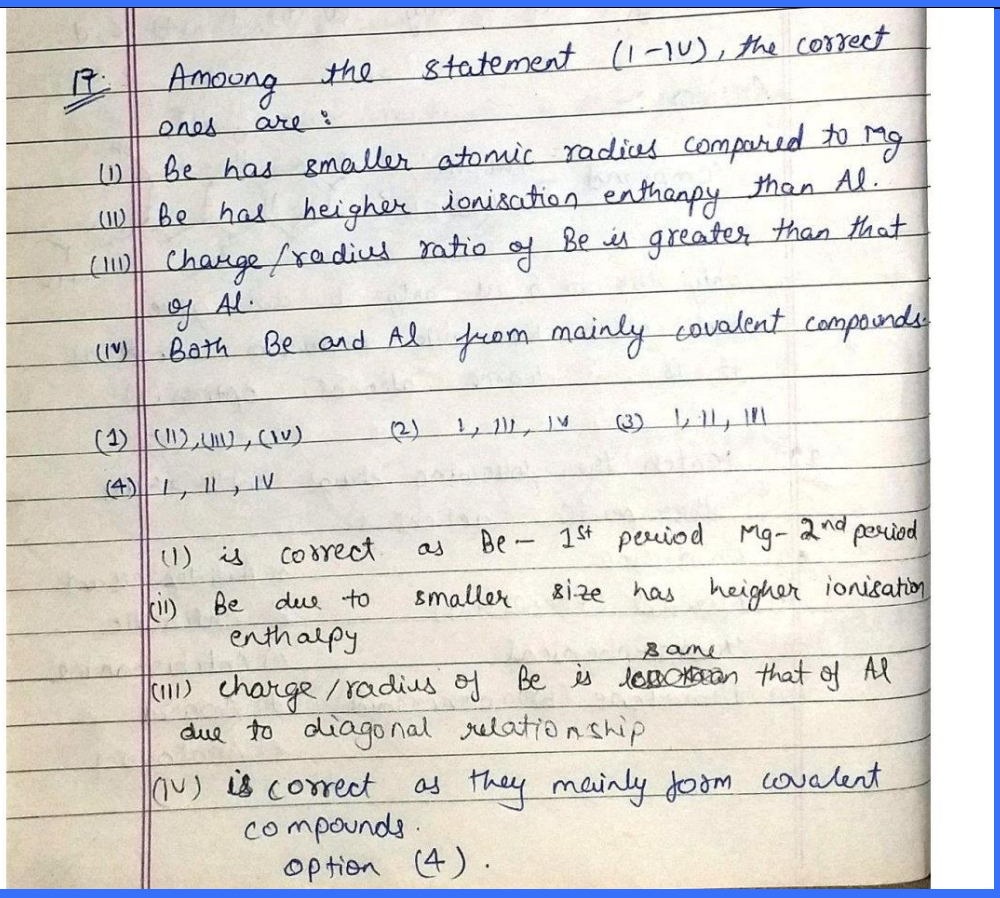


on C conc. KOH imply cannizaro to give  so C must be  now on B ozonolysis was done to give  and

so B must be 

and now from given options one could guess that A must be (3). option (3)

17



17. Amoong the statement (I-IV), the correct ones are :

(I) Be has smaller atomic radius compared to Mg

(II) Be has heigher ionisation enthanpy than Al.

(III) Charge/radius ratio of Be is greater than that of Al.

(IV) Both Be and Al from mainly covalent compounds.

(1) (II), (III), (IV) (2) I, III, IV (3) I, II, III

(4) I, II, IV

(I) is correct as Be – 1st period Mg – 2nd period

(II) Be due to smaller size has heigher ionisation enthalpy

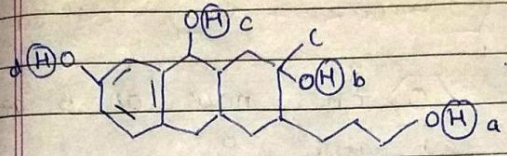
(III) charge/radius of Be is same that of Al due to diagonal relationship

(IV) is correct as they mainly form covalent compounds.

option (4).

18

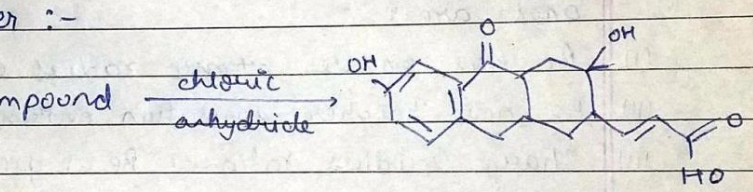
18 Consider the following reaction :



Product P gives +ve ceric ammonium nitrate test. This is because of presence of which of these OH group (s) ?

1) b only (2) d only (3) (b), (d) (4) c, d.

Answer :-



only due to b as only b can give red colour by ceric ammonium nitrate as it is 3 degree alcohol. option (1).

19

19. Match the following drugs with their therapeutic actions :

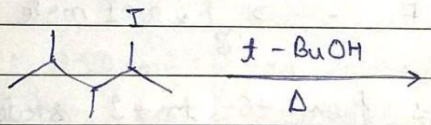
(i) Ranitidine	a) Antidepressant
(ii) Nardil (Phenelzine)	b) Antibiotic
(iii) Chloramphenicol	c) Antihistamine
(iv) Dimetane (Brompheniramine)	d) Antacid
	e) Analgesics

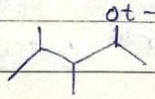
1.) i-a, ii-c, iii-b, iv-e
2.) i-d ii-c iii-a iv-e
3.) i-d ii-a iii-b iv-c
4.) i-e ii-a iii-c iv-d

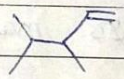
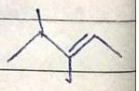
Solution ⇒ This is just information related question
correct match is Ranitidine → Antacid
Phenelzine (Nardil) → Antidepressant
Chloramphenicol → Antibiotics
Brompheniramine → Antihistamine
option 3 is correct.

20

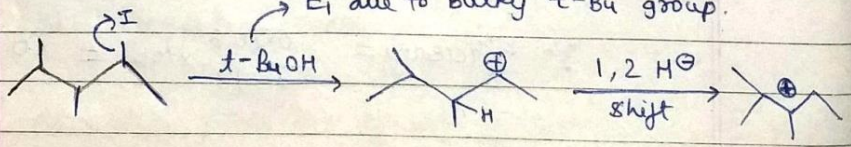
Q.20. The major product in the following reaction is :

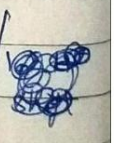


1.) 
(2) 

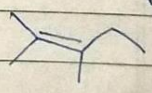
(3) 
4) 

E1 due to bulky t-Bu group.





option 1 is correct.



21

Q.21.

An acidic solution of dichromate is electrolysed for 8 minutes using 2A. As per the following equation

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$$

The amount of Cr^{3+} obtained was 0.104g. The efficiency of the process (in %) is

[Take F = 96000 C, At. mass of Cr = 52]

Solution :-

charge passed in 8 minutes = $2 \times 8 \times 60 = 960\,C$

960 C is equivalent to $\frac{960}{96000} = 0.01\,F$

from above reaction

$$0.01\,F \longrightarrow \frac{1}{3} \times 0.01 \text{ mole}$$

as Cr goes from +6 to +3 state.

so mass of Cr^{3+} obtained = $\frac{1}{3} \times 0.01 \times 52 = 0.173g$

but obtained mass is 0.104g so

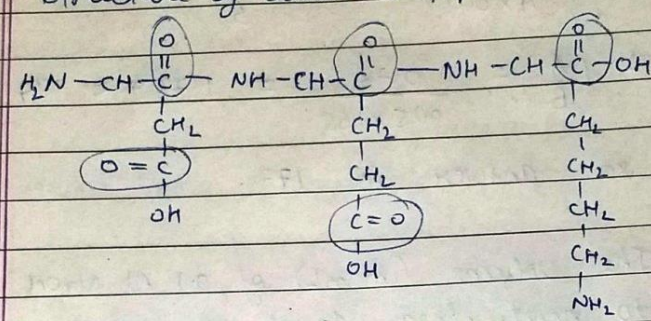
$$\% \text{ efficiency} = \frac{0.104}{0.173} \times 100 = 60\%$$

Answer is 60.

22

22. The no. of $>C=O$ groups present in a tripeptide Asp-Glu-Lys is ——

Structure of above tripeptide is



So total $>C=O$ groups are 5.

23

23. If 250 cm^3 of an aqueous solution containing 0.73 g of a protien A is isotonic with one litre of another aqueous solution containing 1.65 g of a protien B, at 298 K, the ratio of molecular masses of A and B is ____ $\times 10^{-2}$ (to nearest integer)

osmotic pressure of protein $A = \frac{\left(\frac{0.73}{A}\right)RT}{0.25}$

and that of protein $B = \frac{\left(\frac{1.65}{B}\right)RT}{1}$

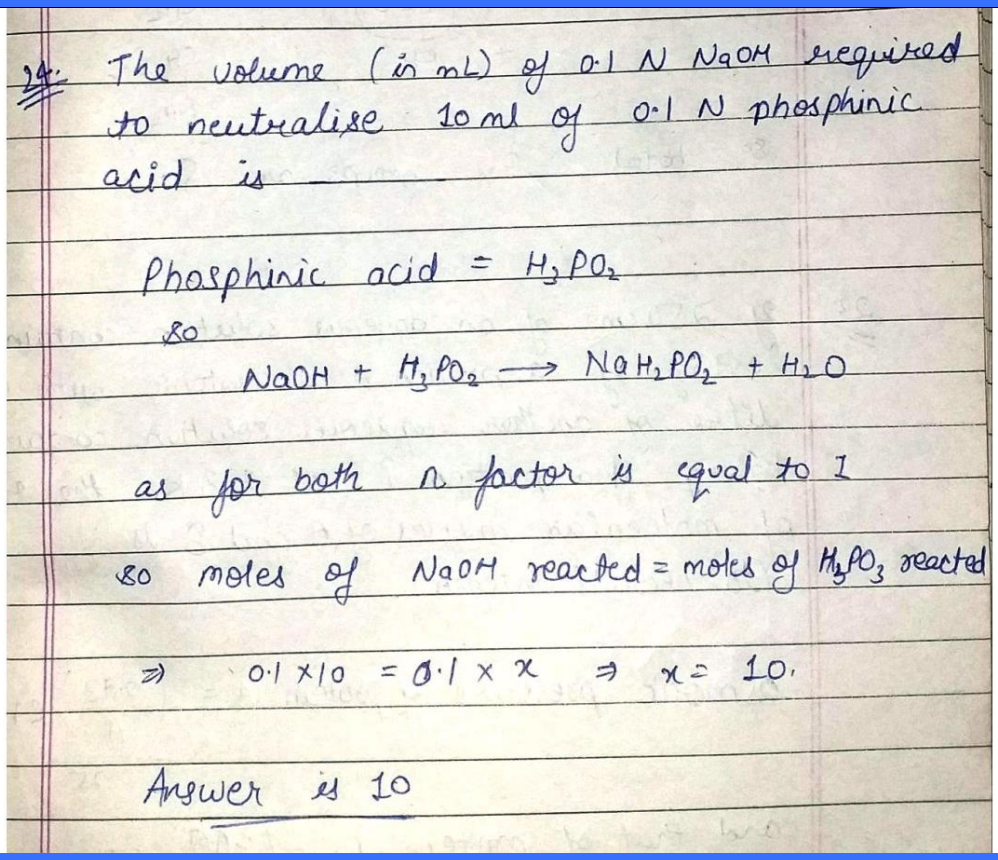
where A and B are molecular masses of A & B respectively but as given they are isotonic so

$$\left(\frac{0.73}{A \times 0.25}\right)RT = \left(\frac{1.65}{B}\right)RT$$

$$\Rightarrow \left(\frac{A}{B}\right) = \frac{0.73}{0.25 \times 1.65} = 1.769 \approx 177 \times 10^{-2}$$

so answer is 177.

24



24. The volume (in mL) of 0.1 N NaOH required to neutralise 10 ml of 0.1 N phosphinic acid is ____

Phosphinic acid = H_3PO_2

So

$$NaOH + H_3PO_2 \longrightarrow NaH_2PO_2 + H_2O$$

as for both n factor is equal to 1

so moles of NaOH reacted = moles of H_3PO_3 reacted

$\Rightarrow$ $0.1 \times 10 = 0.1 \times x \Rightarrow x = 10.$

Answer is 10

25

25. 6.023×10^{22} molecules are present in 10g of a substance 'x'. The molarity of a solution containing 5g of substance 'x' in 2L solution is _____ $\times 10^{-3}$.

moles of x = $\frac{\text{mass}}{\text{molar mass}} = \frac{\text{no. of molecules}}{N_A}$.

molar mass $\Rightarrow \frac{10 \times 6.023 \times 10^{23}}{6.023 \times 10^{22}} = 100\ g/mol$

$\Rightarrow$ molarity = $\frac{\text{mole of solute}}{\text{volume of solution in litre}}$

$= \frac{\left(\frac{5}{100}\right)}{2} \Rightarrow 0.025. = 25 \times 10^{-3}$

so answer is 25.

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