P10-17

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ADVANCED PATTERN PART TEST-4(APT-4)

TARGET : JEE (MAIN+ADVANCED) 2018

SUBJECT : CHEMISTRY COURSE : VIJAY (01JR)

Date : 14-01-2018 Time: 2 Hours Maximum Marks : 168

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

GENERAL :

1. The sealed booklet is your Question Paper. Do not break the seal till you are instructed to do so.
2. The question paper CODE is printed on the right hand top corner of this sheet.
3. Use the Optical Response Sheet (ORS) provided separately for answering the question.
4. Blank spaces are provided within this booklet for rough work.
5. Write your Name and Roll Number in the space provided on the below cover.
6. After the open booklet, verify that the booklet contains all the **40** questions along with the options are legible.

QUESTION PAPER FORMAT AND MARKING SCHEME :

7. This questions paper consists of **four sections.**
8. Each section as detailed in the following table :

Section	Question Type	Number of Questions	Category-wise Marks for Each Question				Maximum Marks of the Section
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
1	One or More Correct Option(s)	14	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	+1 For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened	0 If none of the bubbles is darkened	–2 In all other cases	56
2	Comprehension (One or More Correct Option(s))	6	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	+1 For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened	0 If none of the bubbles is darkened	–2 In all other cases	24
3	Match the Column	2	For each entry in Column-I +2 If only the bubble(s) corresponding to all the correct match(es) is(are) darkened	–	0 if not attempted	–1 In all other cases	16
4	Single digit Integer (0-9)	18	+4 If only the bubbles corresponding to the correct answer is darkened	–	0 if not attempted	–1 In all other cases	72

OPTICAL RESPONSE SHEET :

9. Darken the appropriate bubbles on the original by applying sufficient pressure.
10. The original is machine-gradable and will be collected by the invigilator at the end of the examination.
11. Don not tamper with or mutilate the ORS.
12. Write your name, roll number and the name of the examination centre and sign with pen in the space provided for this purpose on the original.
    Do not write any of these details anywhere else. Darken the appropriate bubble under each digit of your roll number.

DARKENING THE BUBBLES ON THE ORS :

13. Use a **BLACK BALL POINT** to darken the bubbles in the upper sheet.
14. Darken the bubble **COMPLETELY.**
15. Darken the bubble **ONLY** if you are sure of the answer.
16. The correct way of darkening a bubble is as shown here : ●
17. There is **NO** way to erase or "un-darkened bubble.
18. The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.

DO NOT BREAK THE SEAL WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

NAME OF THE CANDIDATE : ……

ROLL NO. : ……

I have read all the instructions and shall abide by them

- -

Signature of the Candidate

I have verified the identity, name and roll number of the candidate.

- -

Signature of the Invigilator

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CHEMISTRY

Atomic masses : [H = 1, D = 2, Li = 7, C = 12, N = 14, O = 16, F = 19, Na = 23, Mg = 24, Al = 27, Si = 28, P = 31, S = 32, Cl = 35.5, K = 39, Ca = 40, Cr = 52, Mn = 55, Fe = 56, Cu = 63.5, Zn = 65, As = 75, Br = 80, Ag = 108, I = 127, Ba = 137, Hg = 200, Pb = 207]

SECTION – 1 : (Maximum Marks : 56)

- This section contains **FOURTEEN** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
Partial Marks	:	+1	For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–2	In all other cases.

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in –2 marks, as a wrong option is also darkened.

Space for Rough Work

1. NaCl (aq.) solution is taken at 0ºC and 1 atm. Now some ice is added in it keeping temperature and pressure constant then :

(A) Vapour pressure of solution will increase

(B) Osmotic pressure of solution will increase

(C) Whole of the added ice will melt

(D) Some amount of ice(s) will exist in solution

2. Colemanite $\xrightarrow{Na_2CO_3}$ x $\xrightarrow{HCl}$ $\underset{\text{Lewis acid}}{y}$ $\xrightarrow{\Delta}$ z $\xrightarrow{Mg}$ $\underset{\text{an element}}{w}$

Identify incorrect statement.

(A) Oxidation number of boron in colemanite is +3.

(B) [z] when heated with Co gives coloured bead.

(C) Almost all compounds of [w] are ionic.

(D) Decahydrated [x] has 3, O–H bonds.

3. A Daniel cell having originally 1.0 M Zn^{++} and 1.0 M Cu^{++}. Sufficient NH_3 has been added to the cathode compartment to make NH_3 concentration 2.0M at equilibrium.

Given K_f for $[Cu(NH_3)_4]^{2+}$ = 1 × 10^{12}, E° for the reaction, $Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$ 1.1V.

(Take $\frac{2.303RT}{F}$ = 0.06, log 6.25 = 0.8).

Select the correct option(s):

(A) Cell potential after addition of NH_3 increases.

(B) Cell potential after addition of NH_3 decreases.

(C) Cell potential after addition of NH_3 is 0.70 V.

(D) Cell potential after addition of NH_3 is 1.4 V.

Space for Rough Work

4. Which of the following reaction(s) generally take place in reverberatory furnace?

(A) $2CuFeS_2 + 4O_2 \xrightarrow{\Delta} Cu_2S + 2FeO + 3SO_2$ (B) $2Cu_2S + 3O_2 \xrightarrow{\Delta} 2Cu_2O + 2SO_2$

(C) $HgS + 2HgO \xrightarrow{\Delta} 3Hg + SO_2$ (D) $Fe_2O_3 + 3CO \xrightarrow{\Delta} 2Fe + 3CO_2$

5. If $\frac{1}{\lambda}$ is plotted against Cλ for a weak electrolyte, where λ is molar conductivity of weak electrolyte at conc. (C) then :

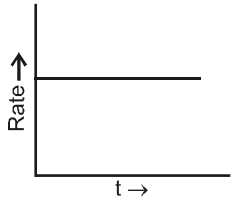
(A) the intercept equal to $\frac{1}{\lambda^\infty}$ (λ^∞ = molar conductivity at ∞ dilution)

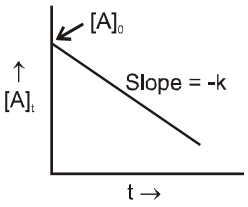
(B) the graph is hyperbolic

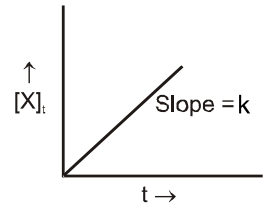
(C) the slope is equal to $\frac{1}{k(\lambda^\infty)^2}$ (k = equilibrium constant)

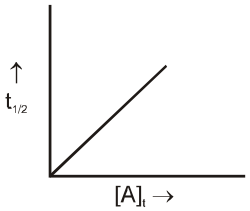
(D) the slope is equal to $\frac{1}{k\lambda^\infty}$ (k = equilibrium constant)

6. Which of the following graphs represents zero order if A $\longrightarrow$ P ?
(Here notations have usual meaning).

(A) 

(B) 

(C) 

(D) 

Space for Rough Work

7. Which of the following solution(s) can form azeotrope?

(A) $HCl + H_2O$ (B) $CH_3COCH_3 + CHCl_3$

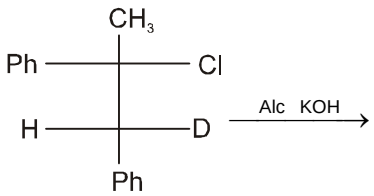
(C) $C_2H_5Br + C_2H_5I$ (D) $C_2H_5OH + H_2O$

8. 0.1 molar aqueous solution of NaCl and water are separated by semi-permeable membrane at 27ºC.

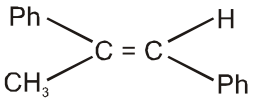
If external pressure of 3 atm is applied on solution side then select incorrect option(s) ($R = \frac{1}{12}$ L atm mol^{-1} K^{-1}) :

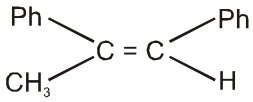
(A) Osmosis will stop. (B) Osmosis will continue.

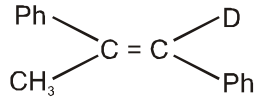
(C) Reverse osmosis will occur. (D) Solute will move from solution to solvent.

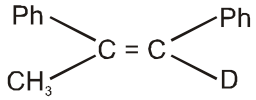
9. 

Possible products are :

(A) 

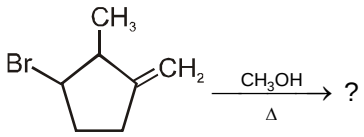
(B) 

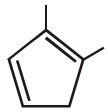
(C) 

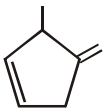
(D) 

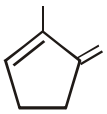
Space for Rough Work

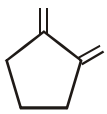
10. Which of the following is/are possible product formed by E1 mechanism for given reaction ?



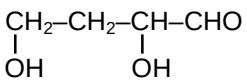
(A) 

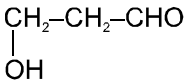
(B) 

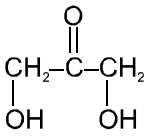
(C) 

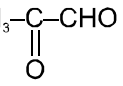
(D) 

11. Which of the following compounds will be oxidised by HIO_4 ?

(A) 

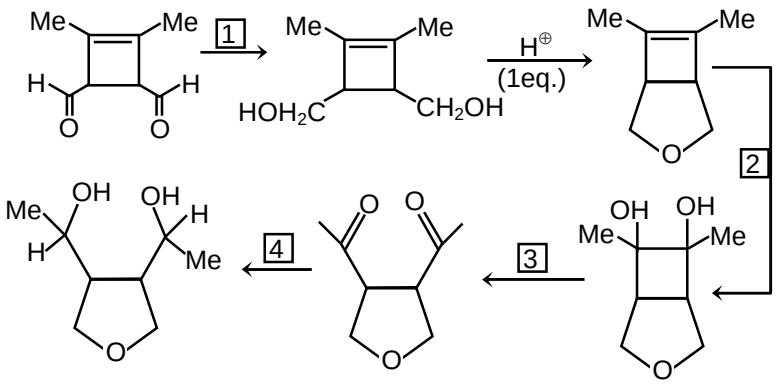
(B) 

(C) 

(D) 

Space for Rough Work

12. Identify the reagents (1-4), required for the transformations shown and arrange them in correct order.



(P) $LiAlH_4$ (Q) OsO_4/ $NaHSO_3$

(R) HIO_4 (S) $NaBH_4$

Which of the following options are correct for following conversion ;

(A) $1 \rightarrow S, 2 \rightarrow Q, 3 \rightarrow R, 4 \rightarrow P$

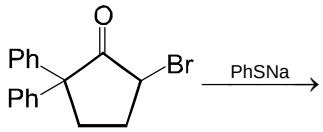
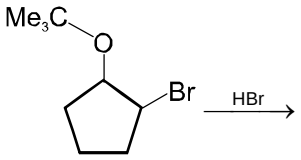
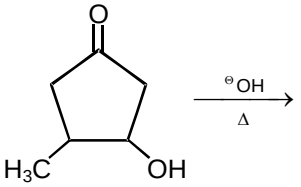
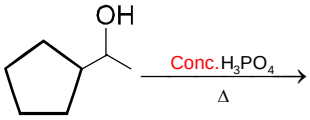
(B) $1 \rightarrow Q, 2 \rightarrow R, 3 \rightarrow P, 4 \rightarrow S$

(C) $1 \rightarrow Q, 2 \rightarrow P, 3 \rightarrow R, 4 \rightarrow S$

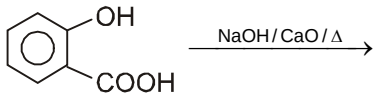
(D) $1 \rightarrow P, 2 \rightarrow Q, 3 \rightarrow R, 4 \rightarrow S$

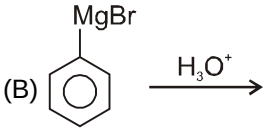
Space for Rough Work

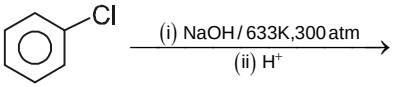
13. Which of the following are correctly matched for the mechanism opted to give major product :

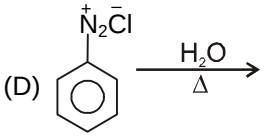
	(Reaction)	**(Mechanism)**
(A)		S_N2
(B)		S_N1
(C)		E2
(D)		E1

14. In which reactions, major product gives positive test with neutral $FeCl_3$:

(A) 

(B) 

(C) 

(D) 

Space for Rough Work

SECTION – 2 : (Maximum Marks : 24)

- This section contains **THREE** paragraphs
- Based on each paragraph, there will be **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
Partial Marks	:	+1	For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–2	In all other cases.

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in –2 marks, as a wrong option is also darkened.

Paragraph for Question Nos. 15 to 16

The Edison storage cell is symbolized $Fe_{(s)} \mid FeO_{(s)} \mid KOH_{(aq)} \mid Ni_2O_{3\,(s)} \mid NiO_{(s)}$

The half cell reactions are :

$$Ni_2O_3(s) + H_2O(\ell) + 2e^- \rightleftharpoons 2NiO(s) + 2OH^-$$

$$E^0 = 0.4V$$

$$FeO(s) + H_2O(\ell) + 2e^- \rightleftharpoons Fe(s) + 2OH^-$$

$$E^\circ = -0.87\ V$$

Answer the following :

Space for Rough Work

15. Select correct option(s) (Atomic mass Ni = 59) :

(A) $E^{o}_{cell} = 1.27\,V$

(B) $E^{o}_{cell} = 0.47\,V$

(C) For the cell reaction $\Delta G° = -90710$ J

(D) 1104 KJ/Kg electrical energy can be obtained per Kg of reactants.

16. Select the incorrect statement(s) :

(A) Cell potential decreases with increase in concentration of KOH

(B) Cell potential increases with increase in conc. of KOH

(C) Cell potential decreases with decreases in conc of KOH

(D) Cell potential remains unchanged with change in conc. of KOH

Paragraph for Question Nos. 17 to 18

Some measurable properties in dilute solution of non-volatile solute in volatile solvent can be distinguished into two types.

(i) Colligative (ii) Constitutional

Colligative properties : Depend on concentration of actual solute particles in solution, but independent of their nature or form i.e. ions, monomer, dimer etc.

Constitutional properties : These properties depend on nature of solute particle and its form, apart from its concentration.

Space for Rough Work

17. Which of the following properties is/are colligative properties?

(A) Resistance of solution

(B) Boiling point.

(C) ΔP (ΔP = vapour pressure of solvent – vapour pressure of solution)

(D) Osmotic pressure

18. The boiling point of a solution of a non volatile solute in water is 101°C, Which is/are correct for this solution ? ($P_{external}$ = 1 atm)

K_b = 0.5 K Kg/mol, K_f = 1.80 K Kg/mol.

(A) If the degree of association or dissociation of solute remain unchanged with temperature, then $\frac{\Delta T_b}{\Delta T_f} = \frac{K_b}{K_f}$.

(B) The vapour pressure of solution at boiling point is 760 torr.

(C) The vapour pressure of solution at boiling point of solvent is nearly 734 torr.

(D) The RLVP (relative lowering in vapour pressure) of solution is $\frac{9}{259}$.

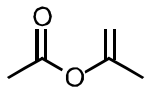
Paragraph for Question Nos. 19 to 20

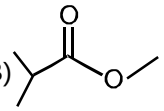
An acyclic compound **P** ($C_6H_{12}O$), give acetone as the only organic product through the following sequence of reactions.

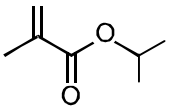
$$P \xrightarrow{NaBH_4} Q \xrightarrow[\Delta]{\text{con. } H_2SO_4} R \xrightarrow[Zn]{O_3/H_2O} \underset{(2\text{ eq.})}{CH_3-\overset{\overset{O}{\|}}{C}-CH_3} \xleftarrow[ii)\ H_3O^+]{i)\ CH_3MgBr\ (1eq.)} T \text{ (ester)}$$

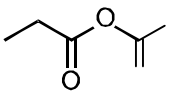
Space for Rough Work

19. The compound 'T' is

(A) 

(B) 

(C) 

(D) 

20. Which of the following statements is/are true about (P) and (Q) ?

(A) (P) gives positive iodoform test.

(B) (Q) gives positive Lucas reagent test.

(C) (R) forms vicinal diol on reaction with Bayer's reagent.

(D) (R) gives Tollen's test.

Space for Rough Work

SECTION – 3 : (Maximum Marks : 16)

- This section contains **TWO** questions
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A),(B), (C) and (D)
- **Column II** has **four** entries (P),(Q), (R) and (S)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**
- The ORS contains a 4 × 4 matrix whose layout will be similar to the one shown below :

(A)	(P)	(Q)	(R)	(S)
(B)	(P)	(Q)	(R)	(S)
(C)	(P)	(Q)	(R)	(S)
(D)	(P)	(Q)	(R)	(S)

- For each entry in **Column I**, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (P), (Q) and (R), then darken these three bubbles in the ORS. Similarly, for entries (B), (C) and (D).

- Marking scheme :

  For each entry in **Column I**

  +2 If only the bubble(s) corresponding to all the correct match(es) is (are) darkened

  0 If none of the bubbles is darkened

  –1 In all other cases

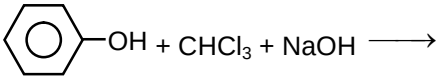
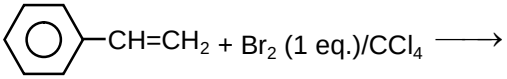
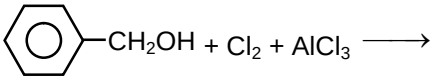
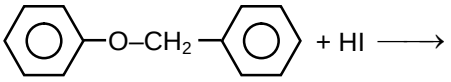
Space for Rough Work

21. Match column I with column II for the reaction : A $\rightarrow$ Products :

(a–x) is the concentration of A at time t

Column-I	**Column-II**
(A) log(a–x) is plotted against 't' in first-order reaction	(P) Slope = 2k
(B) (a–x) is plotted against 't' in zero-order reaction	(Q) Slope = –k/2.303
(C) $(a-x)^{-1}$ is plotted against 't' in second-order reaction	(R) y – intercept is always positive
(D) $(a-x)^{-2}$ is plotted against 't' in third-order	(S) Slope = k

22. Match the **Column** ;

Column-I	**Column-II**
(A) 	(P) Aromatic electrophilic substitution
(B) 	(Q) Electrophilic addition
(C) 	(R) Nucleophilic substitution
(D) 	(S) Carbocation intermediate

Space for Rough Work

SECTION – 4 : (Maximum Marks : 72)

- This section contains **EIGHTEEN** questions
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS
- Marking scheme :

  +4 If the bubble corresponding to the answer is darkened

  0 If none of the bubbles is darkened

  –1 In all other cases

23. A 1 : 3 molar mixture of benzene & toluene is prepared.
The vapour pressure of pure benzene = 600 mm of Hg.
The vapour pressure of pure toluene = 200 mm of Hg.
In 3rd fractional distillation, in vapour of second distillate the ratio of mole fraction of banzene and toluene in vapor phase is 3^x : 1. The value of x is:

24. The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume

$SO_2Cl_2(g) \longrightarrow SO_2(g) + Cl_2(g)$

Exp	Time (sec)	Total pressure (atm)
1	0	0.5
2	100	0.6

If rate of reaction (atm sec^{-1}) when total pressure is 0.65 atm is $y \times 10^{-4}$ (Initially only SO_2Cl_2 is taken) then determine the value of y.
(log2 = 0.3, log3 = 0.48, log4 = 0.6, log 5 = 0.7)

Space for Rough Work

25. To get the silicone $R_3Si–(OSiR_2)_n–SiR_3$ having six Si–O–Si linkage x unit of R_2SiCl_2 and y unit of R_3SiCl is taken. Value of (x + y) is:

26. If certain decomposition reaction found to obey following equation in terms of concentration(C) of reactant:

$\frac{1}{C^2} = 4\,K\,t + 2$, what is the order of reaction(K-rate constant, t-time)?

27. How many of the following statement(s) is/are correct regarding metallurgy of Al ?

(i) In Hall-Heroult process carbon lining steel cathode and graphite anode are used.

(ii) In Bayer's method bauxite is treated with NaOH.

(iii) In Hall-Heroult process Al is obtained at cathode.

(iv) Bayer's method is used for white bauxite.

(v) In Hall-Heroult process electrolyte consist of $Al_2O_3 + Na_3AlF_6$.

(vi) In Hall-Heroult process cryolite lowers the melting point of mixture and increases conductivity.

(vii) Important by-product of Serpeck's method is NH_3.

Space for Rough Work

28. A sparingly soluble salt MX is dissolved in water to prepare 1 L saturated solution. Now 10^{-6} mole NaX (assume 100% dissociation) is added into this. Conductivity of this solution is 29×10^{-6} S/m. If K_{sp} of MX is $a \times 10^{-b}$, then find value of $\frac{(a+b)}{3}$. a is a natural number & $1 \le a \le 9$.

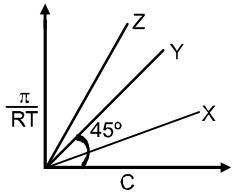
Given : $\lambda^0_{x^-} = 4 \times 10^{-3}$ S m^2 mol$^-$

$\lambda^0_{Na^+} = 5 \times 10^{-3}$ S m^2 mol$^-$

$\lambda^0_{M^+} = 6 \times 10^{-3}$ S m^2 mol$^-$

29. For a zero order reaction calculate ratio of time taken for 75% completion to 25% completion.

30. Following graph shows the relation between $\frac{\pi}{RT}$ and C where π is the osmotic pressure, T is temperature in K, R is gas constant and C is molarity of solute. Given that solute Y neither dissociates nor polymerises in solution. How many of the following statements are correct ? (i - van't Hoff factor).



(i) $i_X < 1$ (ii) $i_Z > 1$

(iii) $i_X > 1$ (iv) $i_Z < 1$

(v) $M_{ABNORMAL} \ge M_{NORMAL}$ for Y (vi) $M_{ABNORMAL} \ge M_{NORMAL}$ for X

(vii) $M_{ABNORMAL} \le M_{NORMAL}$ for Y (viii) $M_{ABNORMAL} \le M_{NORMAL}$ for Z

Space for Rough Work

31. Dry air was passed through a solution having 9 g of solute in 108 g of water and then through pure water. The loss in weight of solution was 3.2 g and that of pure water was 0.08 g. The molar mass in (g/mol) of solute is (Give your answer after dividing by 10) :

32. How many of the following are correct statements ?

(i) The number of oxygen atoms (excluding water of crystalization) in borax which do not form $p\pi$-$p\pi$ back bond is 4.

(ii) B_2H_6 is non-planar.

(iii) B_2H_6 undergo symmetrical cleavage with CO and $(C_2H_5)_3N$

(iv) B_2H_6 undergo unsymmetrical cleavage with NH_3, CH_3NH_2 and $(CH_3)_2NH$.

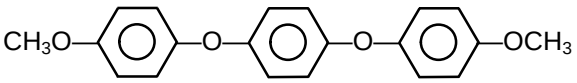
(v) Fullerene (C_{60}) contains 12 five membered rings and 20 six-membered rings.

(vi) Fullerene (C_{60}) has 25 π-bonds.

(vii) In Fullerene (C_{60}) all bonds are not-equivalent.

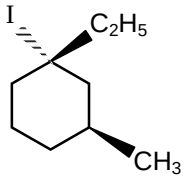
(viii) In Fullerene (C_{60}) a six membered ring is fused with six or five membered rings but a five membered ring can only fuse with six membered rings.

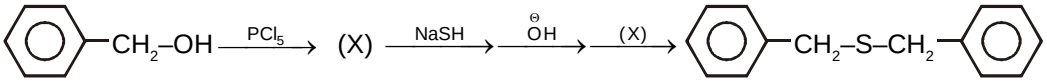
33.



How many moles of HI are consumed in above reaction?

Space for Rough Work

34.  $\xrightarrow[\Delta]{\text{alc. KOH}}$ Number of possible alkene isomers [excluding stereoisomers] will be :

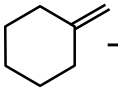
35. 

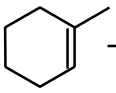
The number of times where S_N2 reaction taken place in above reaction sequence is :

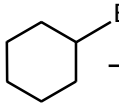
36. An aromatic hydrocarbon has molecular formula $C_{11}H_{16}$. Calculate only structural isomers for $C_{11}H_{16}$, which can give benzene-1,3-dicarboxylic acid on oxidation with boiling alkaline $KMnO_4$ followed by acidification.

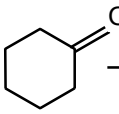
Space for Rough Work

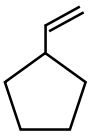
37. Observe the following reactions :

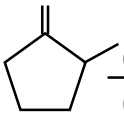
(P)  (1) HBr, (2) H_2O

(Q)  (1) HI, (2) H_2O

(R)  (1) Mg/ether (2) CH_2O (3) $H^{\oplus}$, H_2O

(S)  (1) CH_3MgBr/ether, (2) $H_3O^{\oplus}$

(T)  (1) HBr, (2) H_2O

(U)  (1) HBr / Peroxide, (2) H_2O

How many reactions formed 1-methylcyclohexanol?

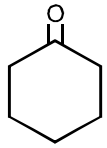
Space for Rough Work

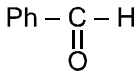
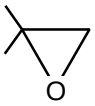
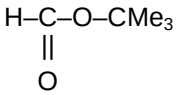
38. $D_3C - C \equiv C - CH_3$ → (Lindlar's Catalyst) → D_2/Ni → X (No. of products)

$D_3C - C \equiv C - CH_3$ → (Birch Reduction) → D_2/Ni → Y (No. of products)

Find the value of (x + y)

39. How many of the following give 3º alcohol with excess Grignard reagent followed by aq. NH_4Cl.

HCHO CH_3CHO  $CH_3 - COOC_2H_5$

40. Number of fraction obtained when cyclopentane is dichlorinated in the presence of Cl_2 / hν (Including stereoisomers) ?

Space for Rough Work