

This question paper contains 36 printed pages]

H.P.A.S. (Main)—2011

CHEMISTRY

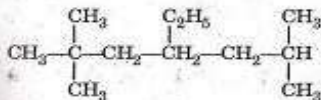
Paper II

Time : 3 Hours

Maximum Marks : 150

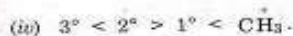
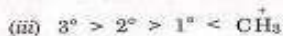
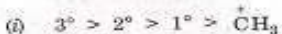
Note :— Question No. 1 is compulsory and attempt any other *four* questions out of the remaining seven questions i.e. attempt *five* questions in all. *All* parts of a question must be attempted in continuation at one place.

1. (a) Give IUPAC name of the compound represented by the structure :



P.T.O.

(b) The stability of carbocation follows the sequence :



(c) Write resonating structures of phenanthrene molecule.

(d) How many moles of styrene are contained in a polystyrene polymer whose molecular weight is 10^6 ?

(e) What are the alkaloids ? Why they are so called ? Give one example each of the following group of alkaloids :

(i) pyridine

(ii) isoquinoline

(iii) tropane.

(f) Which of the following pair hormones controls carbohydrate mechanism and of blood pressure ?

(i) Oxytocine and vasobrassin

(ii) Gastrin and secretin

(iii) Epinephrine and norepineprine

(iv) Cholecystokinin and pancreazymen.

(g) Which of the following groups of oils are rich in oleic acid/ester ?

(i) Olive oil and palm oil

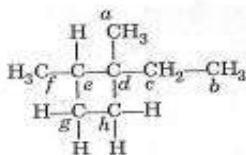
(ii) Kerosine oil and diesel oil

(iii) Clove oil and turpentine

(iv) Linseed oil and coconut oil.

P.T.O.

- (b) In the following representation of a hydrocarbon designate primary, secondary, tertiary and quaternary carbon atoms :



- (i) How many chiral centres are there in glucose (aldohexose) molecule and how many pair of enantiomers of an aldohexose are known. Give the configurations of glucose and its epimer.
- (j) Name the following :
- two compounds that are used as antiseptic
 - one antibiotic with four ring structures

(iii) *two* compounds that are used as analgesic

(iv) *one* compound that is used as antipyretic.

[Give chemical names in all cases except in case of antibiotic where other name is also permissible.] 10×3=30

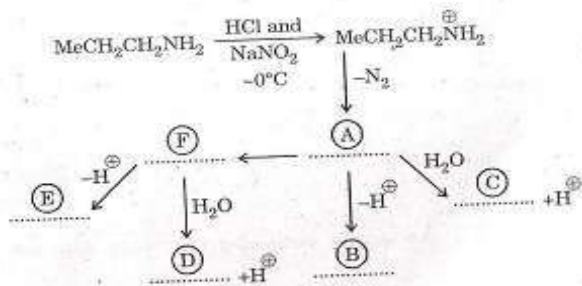
2. (a) (i) Explain the variation in base strength of the following compounds :

Compounds	NH_3 ,	MeNH_2 ,	$\begin{array}{c} \text{Me} \\ \diagdown \\ \text{NH} \\ \diagup \\ \text{Me} \end{array}$,	$\begin{array}{c} \text{Me} \\ \diagdown \\ \text{N} \\ \diagup \\ \text{Me} \\ \diagup \\ \text{Me} \end{array}$
pK _b value	4.75	3.36	3.23	4.20

- (ii) An organic compound picric acid does not have a carboxylic group yet it is strongly acidic ($\text{pK}_a = 1.03$). Explain.

P.T.O.

- (b) The mechanism of the reaction of *n*-propyl amine with nitrous acid is given below. Identify the organic compounds or organic species (ionic) A to F ignoring inorganic compounds and minor organic compounds if any :



[Me stands for methyl group, compounds B and E are same.]

(c) Write few lines what do you know about the following reaction intermediates :

(i) carbonium ion

(ii) carbanion

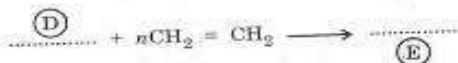
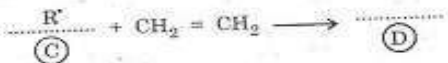
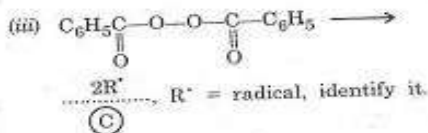
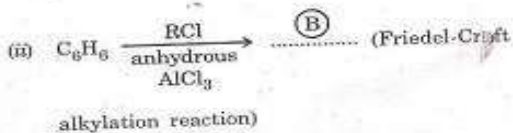
(iii) carbon radical

(iv) carbene.

(d) Complete the following chemical equations and identify these as electrophilic/nucleophilic addition, free radical reaction, nucleophilic/electrophilic substitution reaction. Also identify the organic compound/organic species A to F :

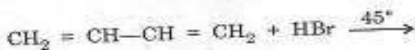


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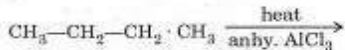
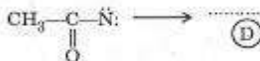


(e) Complete the following chemical equations :

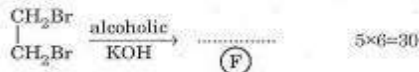
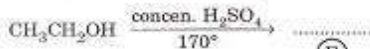
(i) electrophilic addition :



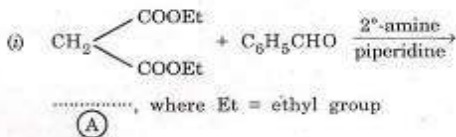
(ii) rearrangement reaction :

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(C)

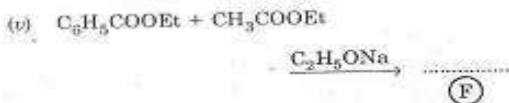
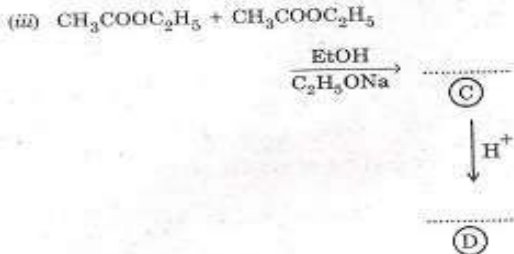
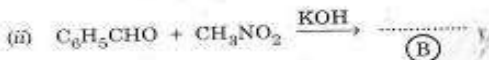
(iii) elimination reaction :



3. (a) Give the main organic products A to F ignoring minor organic and inorganic compounds if any :

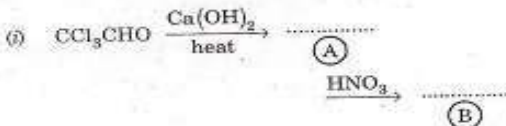


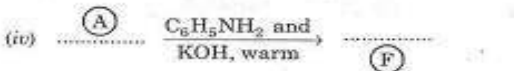
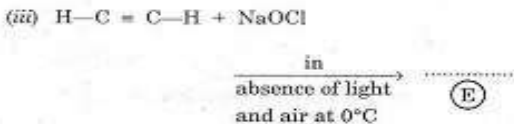
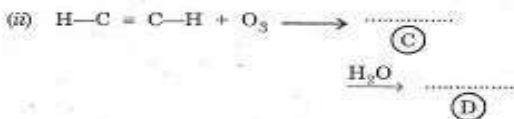
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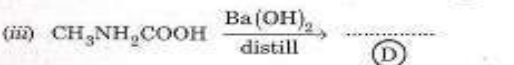
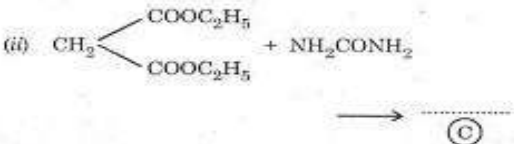
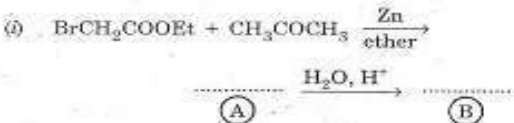
(Et stands for ethyl group)

- (b) Give the main organic products A to F ignoring minor organic and inorganic products, if any :

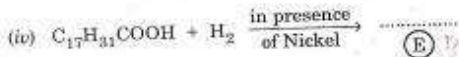




- (c) Give the main organic products A to F ignoring minor organic and inorganic products, if any :



P.T.O.

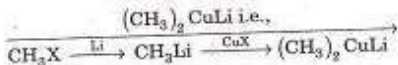
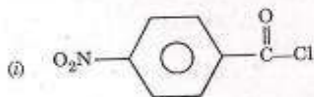


(v) (Structure of natural rubber)
(F)

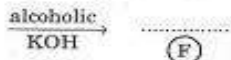
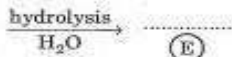
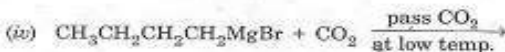
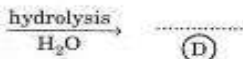
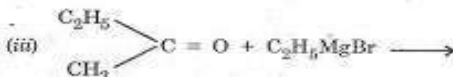
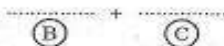
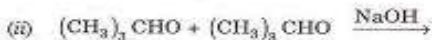
(d) Explain singlet and triplet states with schematic representation of electronic states in a molecule. Also explain energy transfer of singlet excitation and triplet excitation.

(e) Define Einstein's law of photochemical equivalence. What is quantum efficiency of a reaction? Give the causes of low and high quantum yield. 5×6=30

4. (a) Give the main organic products A to F ignoring minor organic and inorganic products, if any :

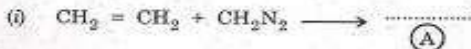


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(A)

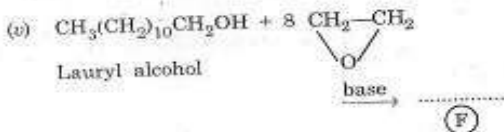
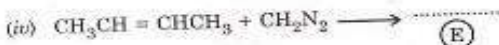
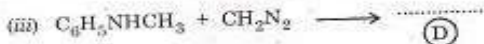
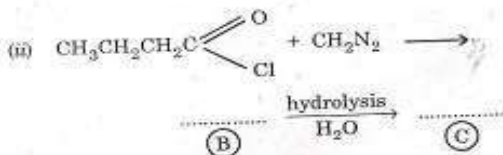


(give the name of F also)

- (b) Give the main organic compounds A to F ignoring minor organic and inorganic products :

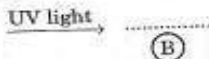
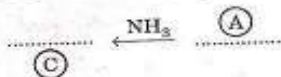
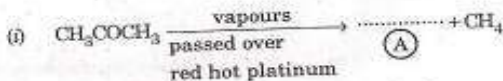


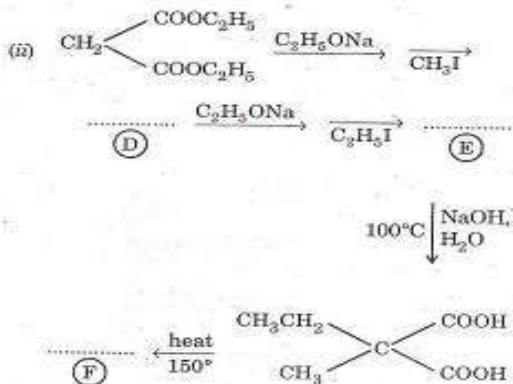
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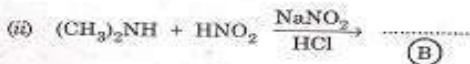
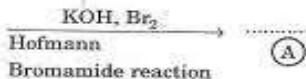
(non-ionic detergent)

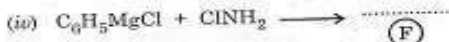
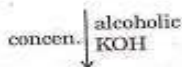
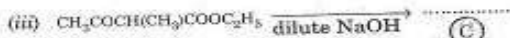
(c) Give the main organic compounds A to F ignoring minor organic and inorganic products, if any :



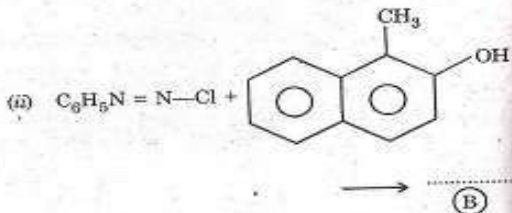
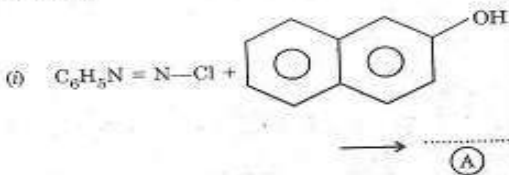


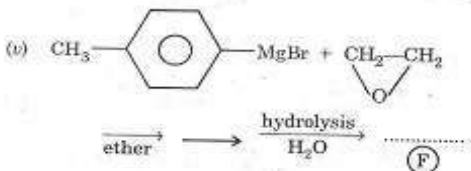
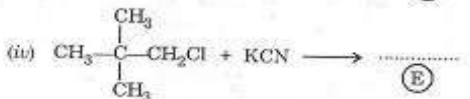
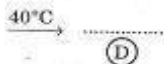
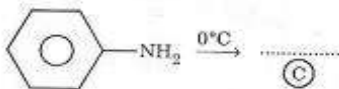
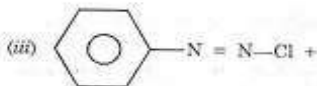
- (d) Give the main organic compounds A to F ignoring minor organic and inorganic products, if any :





- (e) Give the main organic products A to F ignoring minor organic and inorganic products, if any. If no reaction takes write 'no reaction' with reason :





5×6=30

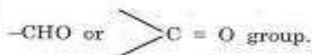
- (5. (a) Which of the following oxidising agent is used to oxidise glucose to gluconic acid ? Give chemical equation. Why other remaining oxidising agents cannot be used for the purpose :

(i) ammonical solution of AgNO_3 (Tollen's reagent)

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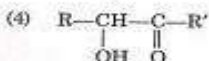
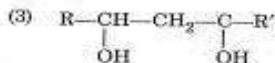
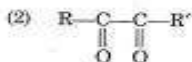
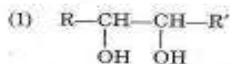
- (ii) alkaline solution of CuSO_4 in the presence of sodium citrate (Benedict's solution)
- (iii) alkaline solution of CuSO_4 in the presence of sodium potassium tartrate (Rochelle's salt), (Fehling solution)
- (iv) Bromine water
- (v) Nitric acid.
- (b) Aldehydes are more easily reduced than ketones. Give chemical equations for the following sequence of reactions by which an aldose (glucose) is converted into ketose (fructose) :
- aldose \longrightarrow osazone \longrightarrow osone \longrightarrow ketose.
- (c) Give the facts which could not be explained properly by Fischer's open chain structure for glucose. Write the proposed cyclic structure for glucose.

- (d) (i) Give the properties which supports that sugar (cane sugar) does not contain free



- (ii) What is invert sugar ? How do you account for the experimentally observed $[\alpha] = -19.9$ for invert sugar ?

- (e) (i) Which of the following compounds does not undergo oxidative cleavage of carbon-carbon bonds by periodic acid :



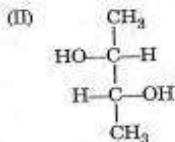
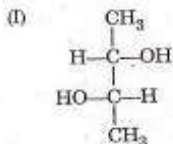
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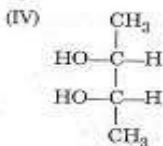
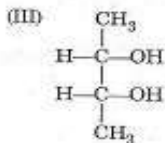
- (ii) Whether glucose with HIO_4 undergoes oxidative cleavage or not. If yes, give chemical equation. 5×6=30

6. (a) Explain number-average molar mass \overline{M}_N and mass average molar mass \overline{M}_M in a polymer.

Equal number of molecules with $M_1 = 10,000$ and $M_2 = 1,00,000$ are mixed, calculate \overline{M}_N and \overline{M}_M .

- (b) 2, 3-dihydroxy butane has the structures I to IV :





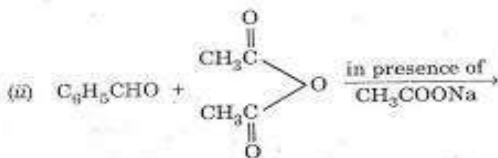
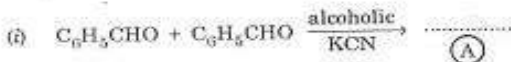
Explain the following with identifications :

- (1) number of chiral centres
 - (2) number of enantiomers
 - (3) number of diastereomers
 - (4) optical activity.
- (c) (i) Write E, Z-configuration of 2-bromo-1-chloropropene.
- (ii) Distinguish between configurational isomer and conformational isomer.

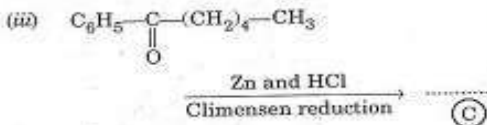
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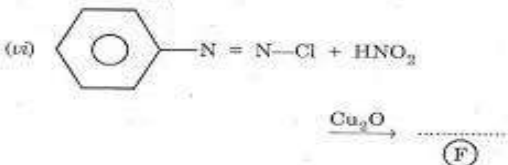
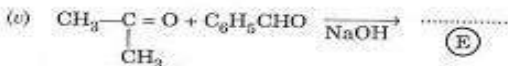
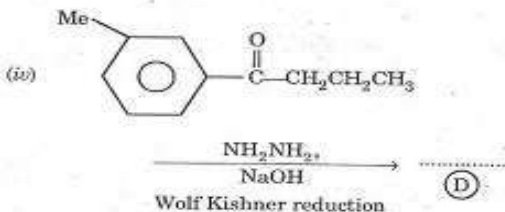
(iii) Give R, S-configuration for stereoisomers of 2, 3-dihydroxy butane [structure I to IV, question 6(b)].

(d) Give the main organic compounds A to F ignoring inorganic and minor organic compounds, if any :



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(B)

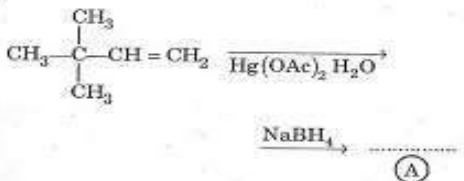




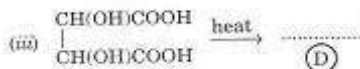
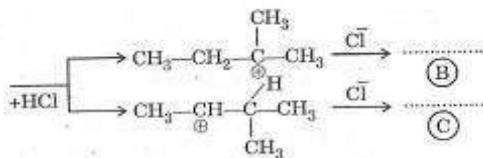
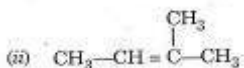
(c) Give the main organic compounds A to F ignoring minor organic and inorganic compounds.

If no reaction takes place, write 'no reaction' :

(i) oxymercuration-demercuration



P.T.O.



5×6=30

7. (a) (i) How many different mononitronaphthalene are possible ?

(ii) All carbon-carbon bonds in naphthalene are not the same. Explain.

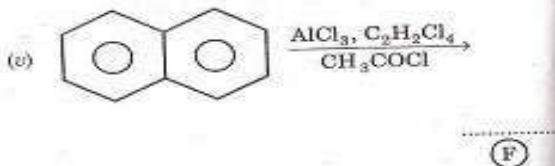
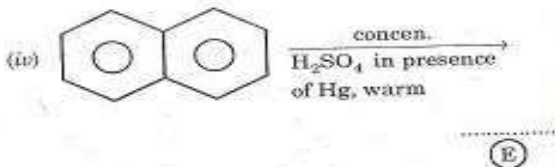
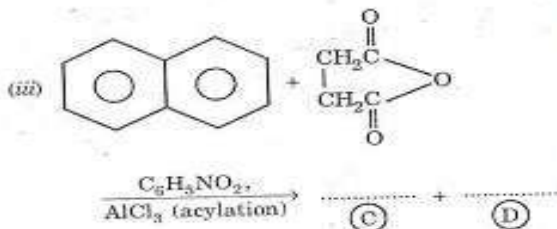
(iii) From a theoretical stand point naphthalene has the structure required of an aromatic compound. Justify.

(b) Give the main organic compounds A to F ignoring minor organic compound and inorganic compound, if any :

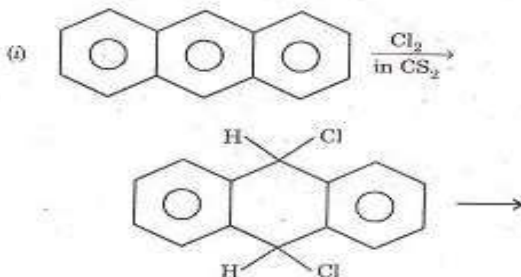


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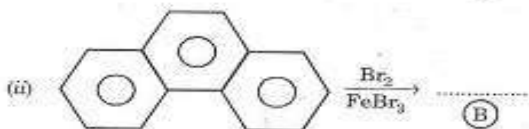
P.T.O.



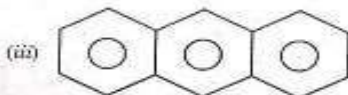
- (c) Give the main organic compounds A to F ignoring minor organic and inorganic compounds, if any :



.....
 (A)



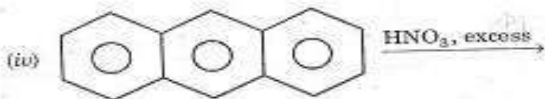
.....
 (B)



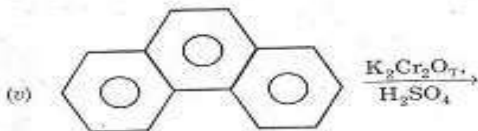
Saturated solution
 in C_6H_6 , exposed
 to sun light

.....
 (C)

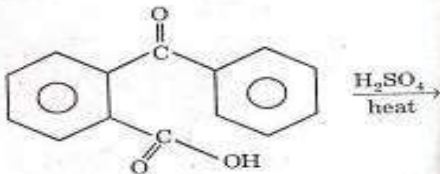
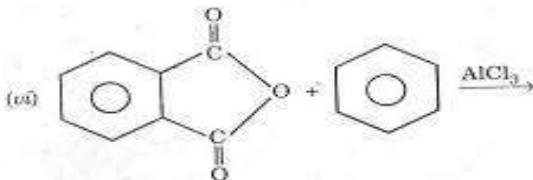
P.T.O.



(D)

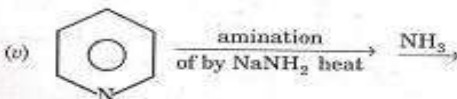
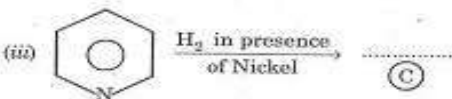
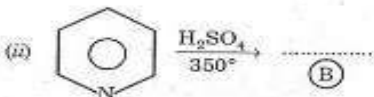
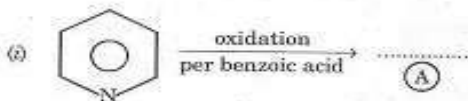


(E)



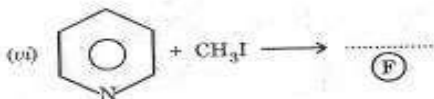
(F)

- (d) Give the main organic compounds A to F ignoring minor organic and inorganic compounds, if any :

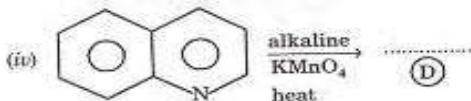
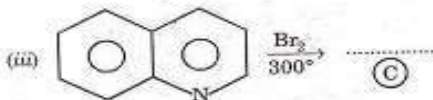
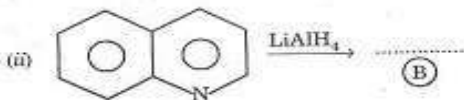
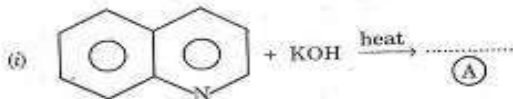


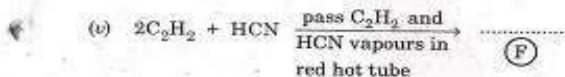
(E)

P.T.O.



(e) Give the main organic compounds A to F ignoring minor organic and inorganic compounds, if any :





5×6=30

8. (a) (1) Which of the following groups of two metals are present in all alloys given below :

German silver, delta metal, Brass, gun metal, bronze.

(i) Cu and Ni

(ii) Sn and Ni

(iii) Sn and Zn

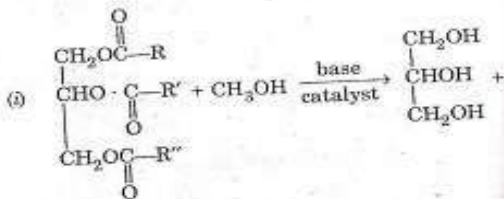
(iv) Cu and Zn

- (2) The compound alloy of Cu and Au crystallises

P.T.O.

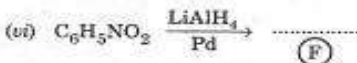
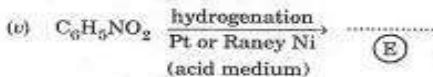
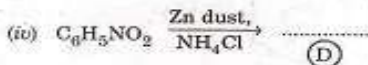
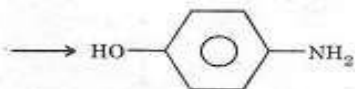
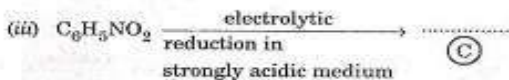
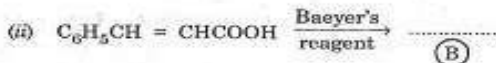
in a cubic lattice with copper at face centres and Au atoms at the corners. How many formula units of the compound are there in a unit cell.

- (b) Give the main organic compounds A to F ignoring minor organic and inorganic compounds, if any :

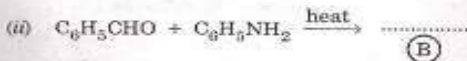
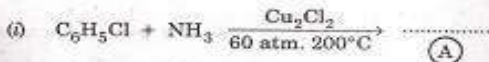


[.....]
[.....]
[.....]

(A)



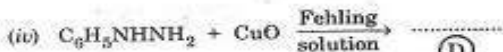
- (c) Give the main organic compounds A to F ignoring minor organic and inorganic compounds, if any :



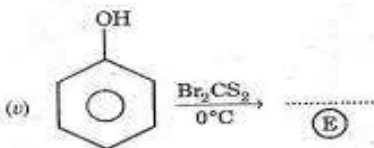
P.T.O.



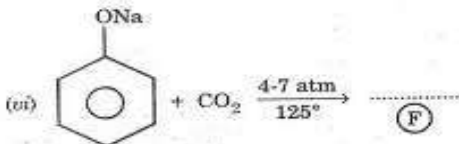
.....
 (C)



(D)



(E)



(F)

- (d) (i) Vitamins are small group of compounds, which of the following vitamin is a powerful antioxidant and its deficiency causes sterility particularly in animals :

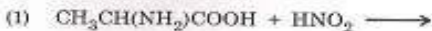
(1) Vitamin K

(2) Vitamin B₂

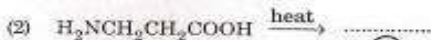
(3) Vitamin E

(4) Vitamin C.

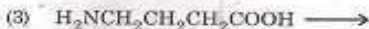
(ii) Give the main organic compounds A to C ignoring minor organic and inorganic compounds, if any :



.....
(A)



(B)

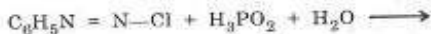


.....
(C)

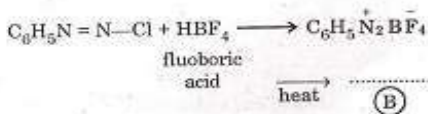
(c) (i) All detergents have a common feature, a feature they share with ordinary soap, they are amphipathic. What is amphipathic ?

P.T.O.

- (ii) Name *three* essential fatty acids which of them is not available in our body but if made available in dietary fats, other two are made by the body itself.
- (iii) Give the main organic compounds A and B ignoring minor organic and inorganic compounds, if any :



.....
 (A)



5×6=30