

INTER B. SC. EXAMINATION, 2017

(1st Semester)

CHEMISTRY (SUBSIDIARY)

PAPER - VS

Time : Two hours

Full Marks : 50

Use a separate answerscript for each group.

GROUP - A

1. a) What are the necessary conditions for the efficiency of a heat engine to be unity and zero and what do these indicate ?
- b) Write down an expression for the efficiency of a reversible engine and develop the concept of entropy from that expression.
- c) Find the increase in the molar entropy of copper when it is heated from 127°C to 927°C. The molar specific heat of copper is given by $C_p = 6.2 + 0.0017T$. 2+4+2
2. a) Derive the following Maxwell's relation :
$$(\delta T / \delta V)_s = -(\delta P / \delta S)_v$$
- b) Prove that $C_p = C_v$ for water at + 4°C. 2+2
3. Deduce thermodynamically a relation between heat of vapourization of a liquid and its vapour pressure. 5

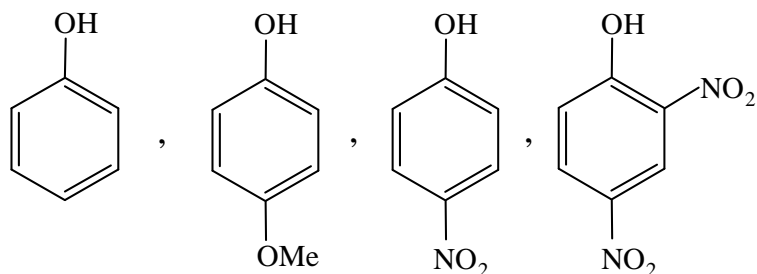
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[2]

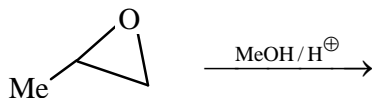
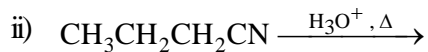
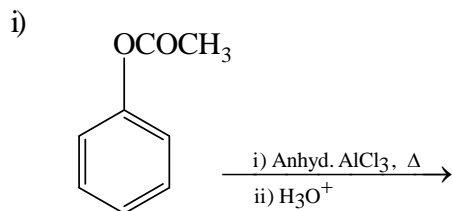
GROUP - B

4. a) Why is *o*-nitrophenol more volatile compared to *p*-nitrophenol? 2

b) Arrange the following compounds in order of increasing acid strength and give reason for your answer. 2

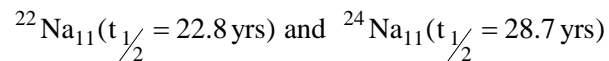


c) Predict the product(s) in the following reactions and explain with plausible mechanism (any *three*): 3×2



[5]

e) i) What is radioactive equilibrium? Give the reason which is having more biochemical importance in between them: 2



ii) Compare nuclear fission and nuclear fusion reactions. 2

iii) The half life of a radioactive element is 5 days. Calculate the time in which its 1/40th of the amount will be lying behind. 1 1/2

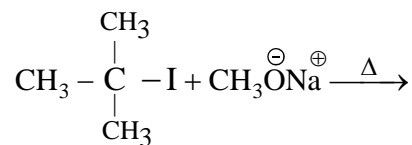
f) Write a short note on (*any one*): 1 1/2

i) Conduction of electricity in Be and Li metals with the help of a Band theory.

ii) Belt of nuclear stability.

[4]

g) What product do you expect from this reaction ? 1

**GROUP - C**

5. a) Predict the geometries of the following molecules explaining the causes of deviation from the regular geometry, if any; (*any two*): 2

i) XeO₃ ii) POCl₃ iii) ClF₃ iv) FClO₂

b) Draw the simple M.O diagram of O₂. Calculate the bond orders of O₂, O₂⁺, O₂⁻ and O₂²⁻, also comment on the magnetic moments of these. 3

c) Why NO₂ will easily dimerise to stable N₂O₄ but ClO₂ will not. Compare the stability of N₂O₅ and Cl₂O₅? 2

d) Explain why (*any two*): 1+1

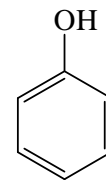
i) (SiH₃)₃N is a weaker base than (CH₃)₃N.

ii) PF₅ is well known but PH₅ is unknown.

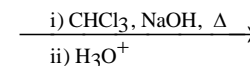
iii) HgCl₂ is white but HgI₂ is crimson-red.

[3]

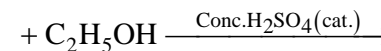
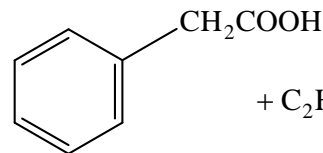
iii)



iv)



v)

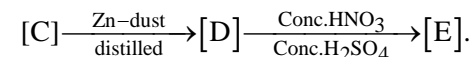
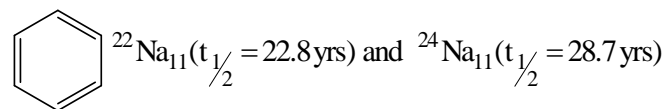


d) Arrange the following acids in the increasing order of their acidic strength explain. 2



e) Why is nitration of phenol carried out with dilute HNO₃ and not with conc. HNO₃ and conc. H₂SO₄ mixture? 1 1/2

f) Complete the following sequence of reactions. Identify the structures from [A] to [E]. 2 1/2



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