M.Sc. CHEMISTRY
Fourth Semester (Repeat)
PHYSICAL CHEMISTRY (SP2) - V
(MSC – 403 C)

Duration: 3Hrs. **Full Marks: 70**

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins. **Marks: 50**

Answer any *four* from *Question no.* 2 to 8
***Question no.* 1 is compulsory.**

1. i. Explain Type I and Type II superconductors with examples. (5)
   ii. What are IBM and EBM? Explain the effect of IBM and EBM on the behavior of polymer molecule. (3)
   iii. Describe stress-strain equation for the simple stretching of an elastomeric compound. (2)
2. i. Explain the origin of depletion and inversion of metal-semiconductor junctions. (5)
   ii. What are cooper pairs? Discuss the BCS theory of superconductivity. (5)
3. Explain the characteristics parameters and the hysteresis loop of ferromagnetic material. (10)
4. i. What is polymer degradation? Explain oxidative degradation with mechanism of rubber oxidation. (6)
   ii. How wasted plastic can be recycled? (4)
5. i. What do you mean by rheology of plastic? Write the mechanism of plastic deformation. (5)
   ii. Derive Gibbs-Duhem equation. Write its application also. (3)
   iii. Express spherical model postulated for the shape of macromolecules in solution. (2)

6. What is glass transition temperature? What are the conditions on which the state of phase changes in case of crystalline and amorphous polymer? Write the factors influencing glass transition temperature. (1+3+6=10)

7. i. What is polymorphism in solids? What are the characteristics of Martensitic transformation in solids? (2+4=6)

   ii. Discuss the Wagner theory for solid state reactions. (4)

8. i. Define intrinsic and extrinsic semiconductor. Write the expression for electrical conductivity of intrinsic semiconductors. (5)

   ii. What is photoconductivity? Explain the mechanism of photoconduction in semiconductor. (5)

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REV-00
MSC/02/08

2017/08

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Duration: 20 minutes **Marks – 20**

(PART A - Objective Type)

I. Choose the correct answer: **1×20=20**

1. In an intrinsic semiconductor, the Fermi level:
   a. Lies at the center of forbidden energy gap
   b. Is near the conduction band
   c. Is near the valence band
   d. May be anywhere in the forbidden energy gap

2. The p-type semiconductor is obtained when Si is doped with:
   a. Al
   b. Ge
   c. Ga
   d. As

3. The band gap is highest in which case?
   a. Metals
   b. Conductors
   c. Semiconductors
   d. Insulators

4. The zone in a semiconductor-semiconductor junction where free charge carrier exists is:
   a. Anode region
   b. Cathode region
   c. Depletion region
   d. Inversion region

5. In superconductivity the conductivity of a material becomes:
   a. Zero
   b. Finite
   c. Infinite
   d. None of these

6. The electrons in a cooper pair behaves as a:
   a. Phonons
   b. Bosons
   c. Fermions
   d. All of these

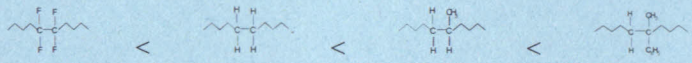
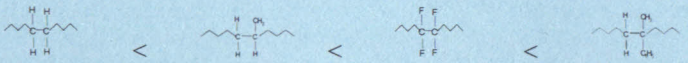
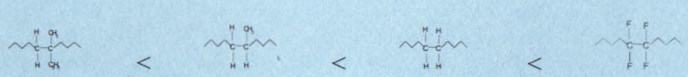
7. Magnetic permeability greater than unity for which one of the following material?
   a. Diamagnetic
   b. Paramagnetic
   c. Antiferromagnetic
   d. Both (b) & (c)

8. The magnetic lines of force cannot penetrate the body of a superconductor, the phenomenon is known as:
   a. Isotopic effect
   b. BCS theory
   c. Meissner effect
   d. London theory

9. The phonons are defined as:
   a. The force constant of the bonds in a lattice
   b. The frequency of the lattice vibrations
   c. The isotopic effects
   d. The quanta of the lattice vibrations

10. Diffusionless phase transformations in solids are referred to as:
    a. Spinodal decomposition
    b. Martensitic transformations
    c. 1st order nucleation
    d. None of the above

11. The magnetization of a superconductor is given by:
    a. 0 b. 1 c. H d. -H

12. Which of the following is correct order of increasing thermal stability?
    a.  <
    b.  <
    c.  <
    d.  <

13. Which of the following is true for Tg and Tm relationship?
    a. 1/2 < Tm/ Tg < 2/3
    b. 1/2 > Tm/ Tg > 2/3
    c. 1/2 < Tg/ Tm < 2/3
    d. 1/2 > Tg/ Tm > 2/3

14. According to Newton's model which one of the following is correct?
    a. Stress is proportional to strain
    b. Stress is proportional to rate of strain
    c. Stress is independent of rate of strain
    d. None of the above

15. Ultrasonic waves have frequency:
    a. Above 20,000 Hz
    b. Below 20,000 Hz
    c. Below 20 Hz
    d. In between 20 and 20,000 Hz

16. Rubbery state of a polymer is:
    a. Below Tf
    b. Above Tg
    c. In between Tg and Tf
    d. All of these

17. The excluded volume of a polymer chain is _____ times greater than that of a single sphere.
    a. 4 b. 8 c. 16 d. 32

18. Which of the following polymer has the highest Tg value?
    a. Polyethylene
    b. Methylpolyacrylates
    c. Ethylpolyacrylates
    d. Butylpolyacrylates

19. Deformation behavior of a polymer is generalized by:
    a. Newton Model
    b. Voigt Model
    c. Maxwell Model
    d. Burger Model

20. Amorphous polymer has/have:
    a. Only Tg
    b. Only Tm
    c. Only Tf
    d. Both Tg and Tf

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University of Science and Technology, Meghalaya

Date Stamp:_____

SESSION 2016-17

COURSE_____PAPER CODE:_____

NAME OF THE PAPER:_____

SEMESTER_____

Instructions to Candidates

1. This answer booklet has 4 pages. Please check before writing whether it is complete or in good condition.
2. Do not write your name anywhere in the answer booklet.
3. Write legibly on both sides of the paper
4. You may use some space for any rough notes or calculation on the answer booklet if you need. These rough notes, calculations must be scored out before submitting the answer booklet.
5. Do not bring any book or loose paper in the examination hall.
6. Do not tear any page from the answer booklet.
7. Do not write anything on the question paper or blotting paper or any pieces of paper while you are in the examination hall.
8. Any act of indiscipline or misbehavior in the examination hall will result in your expulsion.
9. No examinee is allowed to leave the examination hall until 30 minutes lapse after the commencement of the examination.
10. Additional answer sheet will be supplied after the main answer booklet is completed.

For Objective Type Questions

Page No.	Marks
Total	

For Descriptive Type Questions

Question No.	Marks
Total	
Grand Total	

Session: 2016-17

Course_____

Roll No._____

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