Write the following information in the first page of Answer Script before starting answer

ODD SEMESTER EXAMINATION: 2020-21

Exam ID Number_____

Course_____ Semester_____

Paper Code _____Paper Title _____

Type of Exam: _____ (Regular/Back/Improvement)

Important Instruction for students:

1. Student should write objective and descriptive answer on plain white paper.
2. Give page number in each page starting from 1st page.
3. After completion of examination, Scan all pages, convert into a single PDF, rename the file with Class Roll No. **(2019MBA15)** and upload to the Google classroom as attachment.
4. Exam timing from 10am – 1pm (for morning shift).
5. Question Paper will be uploaded before 10 mins from the schedule time.
6. Additional 20 mins time will be given for scanning and uploading the single PDF file.
7. Student will be marked as ABSENT if failed to upload the PDF answer script due to any reason.

B.Sc. CHEMISTRY
THIRD SEMESTER (REPEAT)
PHYSICAL CHEMISTRY-I
BSC-102

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

(PART-A : Objective)

Time : 20 min. **Marks : 20**

Choose the correct answer from the following: ***1X20=20***

1. If a gas expand at constant temperature then:
- **a.** The pressure increases
- **b.** The number of molecule of the gas increases
- **c.** The kinetic energy of the molecule remain same
- **d.** The kinetic energy of the molecule decreases

2. The r.m.s. velocity of a gas depend upon:
- **a.** Molar mass only
- **b.** Temperature only
- **c.** Both molar mass and temperature
- **d.** None of these

3. Who among the following scientist has not done any important work on gases?
- **a.** Charles
- **b.** Boyle
- **c.** Avogadro
- **d.** Faraday

4. Choose the correct one:
- **a.** $C_{rms} > C_{av} > C_p$
- **b.** $C_p > C_{rms} > C_{av}$
- **c.** $C_p > C_{av} > C_{rms}$
- **d.** $C_{rms} > C_p > C_{av}$

5. The vibrational degree of freedom for CO_2 molecule is:
- **a.** 3
- **b.** 4
- **c.** 6
- **d.** 12

6. Which of the following is correct for critical pressure?
- **a.** $a/27R^2$
- **b.** $b/27a^2$
- **c.** $b/27R^2$
- **d.** $a/27b^2$

7. The temperature at which the second virial co-efficient of real gas is zero is known as:
- **a.** Critical temperature
- **b.** Boyle's temperature
- **c.** Boiling temperature
- **d.** None of these

8. Among the following which one will suitable for a real gas closely approaches to the behavior of an ideal gas?
- **a.** 15 atm 200 K
- **b.** 1 atm 273 K
- **c.** 0.5 atm 500 K
- **d.** 15 atm 500 K

9. Methyl orange is a:
- **a.** Weak base
- **b.** Strong base
- **c.** Weak acid
- **d.** Strong acid

10. P^H is expressed as:
a. log (H^+) **b.** –log (H^+)
c. -ln (H^+) **d.** ln (H^+)

11. Ionic product of water is given by:
a. 1×10^{-13} $mol^2\,dm^{-6}$ **b.** 1×10^{-12} $mol^2\,dm^{-6}$
c. 1×10^{-11} $mol^2\,dm^{-6}$ **d.** 1×10^{-14} $mol^2\,dm^{-6}$

12. Phenolphthalein is a:
a. Strong base **b.** Weak base
c. Strong acid **d.** Weak acid

13. P^H range of phenolphthalein is:
a. 8.0-9.8 **b.** 10.1-12.1
c. 1.2-1.8 **d.** 4.2-6.3

14. According to Trouton rule for a simple non-hydrogen bonded liquid, ΔS_{vap} (in units of J $K\,mol^{-1}$) is approximately:
a. 80 **b.** 82
c. 85 **d.** 88

15. The surface tension of a liquid vanishes roughly _____above the critical temperature.
a. 4° **b.** 3°
c. 6° **d.** 5°

16. The Reynolds number for the laminar flow of a liquid through a pipe is approximately equal to:
a. 2000 **b.** 25000
c. 3000 **d.** 4500

17. Which among the following is not an amorphous solid?
a. Polythene **b.** Graphite
c. Clay **d.** Glass

18. Which of the following not a correct way of writing Miller indices?
a. (h, k, l) **b.** {h, k, l}
c. [h, k, l] **d.** All of them

19. Total numbers of point groups in solids are:
a. 7 **b.** 14
c. 32 **d.** 230

20. Which of the following terms are used for liquid crystals?
a. Nematic **b.** Smectic
c. Lyotropic **d.** All of them

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(PART-B : Descriptive)

Time : 2 hrs. 40 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. **a.** State and explain the three gas laws. Using these laws derive an expression for ideal gas equation. 5

b. The surface tension of water is 72.8 dynes cm^{-1}. Calculate the energy required to disperse one spherical drop of radius 3.0 mm into spherical drops of radius 3.0×10^{-3} mm. 5

2. Write some of the postulates of kinetic theory gases. Derive an expression for kinetic gas equation from kinetic theory. 4+6=10

3. **a.** What do you mean by a real gas and an ideal gas? Explain with suitable examples about the non ideal behavior of an ideal gas. 6

b. Determine the ratio between root mean square velocity, average velocity and most probable velocity. 4

4. **a.** Determine the volume correction term in van-der-Wall's equation and write the equation. What happen with van-der-Wall's equation at low pressure, explain. 3+2=5

b. Determine the relationship between van-der-Wall's constants and virial co-efficients. 5

5. **a.** With the help of hole theory describe the affect of temperature on viscosity of liquids. 3

b. Write down three laws of crytallography. 3

c. Derive relationship between interplanner distance and miller indices. 4

6. **a.** Mention two differences between Frenkel and Schottky defects. 2

b. Describe difference between nematic and smectic liquid crystals. 3

c. KNO_3 crystallizes in orthorhombic system with the unit cell dimensions a = 542pm, b=917pm and c=645pm. Calculate the diffraction angles for first order X-ray refelction from (100), (010) and (111) planes using radiation with wave length=154.1 pm. 5

7. **a.** Define p^H of a solution. What is common ion effect? Explain. 5

b. Explain the dissociation of a monobasic acid and determine the dissociation constant. The dissociation constant of formic acid and acetic acid are 1.77×10^{-4} and 1.75×10^{-5} respectively, calculate the relative strength of the two acids. 5

8. **a.** What is an acid base indicator? Explain the titration of a strong acid with a strong base. 5

b. Write the action of phenolphthalein. What is its limitation? 5

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