STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

(For candidates admitted from the academic year 2019 & thereafter)

SUBJECT CODE: 19CH/MC/PC33

B.Sc. DEGREE EXAMINATION, NOVEMBER 2021

BRANCH IV – CHEMISTRY

THIRD SEMESTER

COURSE: MAJOR CORE

PAPER: PHYSICAL CHEMISTRY-I **MAX .MARKS: 100**

TIME: 3 hours

SECTION-A

Answer all the questions: **(15x2=30 Marks)**

I. Choose the correct answer :

1. K_{sp} for Ag_2SO_4 is expressed as _____

a) s^2 b) $27s^4$ c) $4s^3$ d) $108s^5$

2. The molecule that has net dipole moment is_____

a) PH_3 b) IF_7 c) CO_2 d) CCl_4

3. The ionisation constant of dimethylamine is 5.40 $x10^{-4}$ the ionisation constant of its conjugate acid is_____

a) $1.33x10^{-11}$ b) $1.23x10^{-11}$ c) $1.29x10^{-10}$ d) $0.123x10^{-11}$

4. Borax belongs to _____crystal system

a) hexagonal b) orthorhombic c) monoclinic d) cubic

5. The number of planes of symmetry in a crystal is _____

a) six b) four c) nine d) two

II. Fill in the blanks:

6. Precipitation occurs when ionic product is _____greater than solubility product.

7. In a crystalline solid, anions B are arranged in ccp lattice and cations A occupy 50% of the octahedral voids and 50% of the tetrahedral voids . The formula of the solid is _____

8. Aluminium phosphate is an example for a salt of _____acid and _____base.

9. RbI has _____structure.

10. Structure of p-azoxyanisole is _____

III. State True or False:

11. μ of AsH_3 is 0.2 D
12. For a plane –a: b: ∞, Miller indices is (110)
13. TiO_2 belongs to triclinic crystal system.
14. Transition point of p-cholesteryl benzoate is 175˚C.
15. $Fe(OH)_3$ is a sparingly soluble salt.

SECTION-B

IV. Answer any five: **(5x8=40 Marks)**

16. Calculate the % of space occupied by a sphere in a bcc unit cell.

17. Discuss the applications of solubility product.

18. Draw and explain the unique structural features of NiAs

19. Define the following terms and also give their expressions:

a) magnetic permeability b) magnetic susceptibility c) buffer capacity d) dipole moment

(4x2 marks each=8)

20. Complete the Weiss indices , Miller indices for faces having intercepts.

a) a: b/3:c/2 b) a/2:b/4:∞ c) ∞: b:∞ d) 2a:4b:3c

(4x2 marks each=8)

21.What are buffers? Derive Henderson-Hasselbalch equation and explain its significance.

22. NaCl has face-centered cubic lattice, illustrate with the use of X-ray diffraction technique.

SECTION-C

V. Answer any two: **(2x15=30 Marks)**

23.Derive the expression for K_h, h and pH of hydrolysed salt solution of potassium cyanide.

24.a) Discuss the significance , types, structures and applications of liquid crystals

b)Differentiate between diamagnetism , paramagnetism and ferromagnetism with suitable examples.

(10+5)

25.a) Equal volumes of 0.02 M Na_2SO_4 and 0.02 M $BaCl_2$ are mixed together. Predict whether precipitation will occur or not. K_{sp} of $BaSO_4$ is $1.5x10^{-9}$.

b) An element having atomic mass 60 has face centered cubic unit cells. The edge length of the unit cell is 400 pm.Calculate the density of the element.

c) Explain the Schottky defects in stoichiometric crystals. What are the consequences of Schottky and Frenkel defects in crystals?

(5+4+6)

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