Paper Code - 5003

M.Sc. Semester-III Chemistry (Old Course)
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CHN-601 Physical Chemistry

કુલ સમય :– : ૬૦ મીનીટ કુલ પ્રશ્નો : ૫૦ વિદ્યાર્થીએ ટીક કરવાના પ્રશ્નો : ૩૫

નોંધ : વિદ્યાર્થીએ માત્ર ૩૫ પ્રશ્નો જ ટીક કરવાના રહેશે. જો વધારે ટીક કરેલ હશે તો પ્રથમ ૩૫ પ્રશ્નો જ ગણતરીમાં લેવામાં આવશે.

1. The fact that the fluorescence wavelength is often much longer than the irradiation wavelength (Stokes shift) is a consequence of which phenomenon?
   (a) Low extinction coefficients (Lambert-Beer law) (b) Vertical transitions (Kasha's rule)
   (c) High ISC rates (El Sayed rule) (d) The Franck-Condon principle
2. Which regions of the light radiations of the visible ultraviolet lying between – wavelength are chiefly concerned in bringing about photochemical reactions?
   (a) 1000 Å and 2000 Å (b) 1500 Å and 1000 Å (c) 8000 Å and 2000 Å (d) 19000 Å and 12000 Å
3. Which of the following instruments is used to measure the energy of the monochromatic radiation most accurately?
   (a) Photoelectric cell (b) Thermopile (c) The potential detector (d) The chemical acidometer
4. What are the appropriate reasons for the deviation from the Beer's law among the following?
   (a) Monochromaticity of light (b) Very high concentration of analyte
   (c) Association of analyte (d) Dissociation of analyte
5. Which one of the following is not used to dope a semiconductor?
   (a) Al (b) B (c) In (d) Au
6. How many unit cells are divided equally in a face-centred cubic lattice?
   (a) 2 (b) 4 (c) 6 (d) 8
7. A crystalline solid:
   (a) Changes abruptly from solid to liquid when heated. (b) Has no definite melting point
   (c) Undergoes deformation of its geometry easily (d) Has irregular 3-dimensional arrangements.
8. In a simple cubic, body-centred cubic and face-centred cubic structure, the ration of the number of atoms present is respectively?
   (a) 8:1:6 (b) 1:2:4 (c) 4:2:1 (d) 4:2:3
9. Na and Mg crystallize in crystals of bcc and fcc form respectively and then the amount of Na and Mg atoms present in their respective crystal unit cells is?
   (a) 4 and 2 (b) 9 and 14 (c) 14 and 9 (d) 2 and 4
10. Ferrous oxide has a cubic structure and each unit cell edge is 5.0A Assuming the oxide density is 4.0g / cm^3 , the amount of Fe^{2+} and O^2 ions in each unit cell will then be?
    (a) Four $Fe^{2+}$and four O^{-2} (b) two Fe^{2+} and four O^{-2} (c) four Fe^{2+} and two O^{-2} (d) three Fe^{2+} and three O^{-2}
11. Each of the following solids shows the Frenkel defect except
    (a) ZnS (b) AgBr (c) Agl ((d) KCl
12. Schottky defect in a crystal is observed when
    (a) The ion leaves its normal position and occupies an interstitial location
    (b) The unequal number of cation and anions are missing from the lattice
    (c) The density of the crystal increases.
    (d) An equal number of cations and anions are missing from the lattice.
13. Copper crystalline in FCC with a unit cell length of 361pm. What is the radius of a copper atom?
    (a) 128pm (b) 157pm (c) 181pm (d) 108pm
14. The total no of voids in 0.5 mol of a compound forming hexagonal close packed structure are?
    (a) 6.022×10^{23} (b) 3.011×10^{23} (c) 9.033×10^{23} (d) 4.516×10^{23}
15. For the orthorhombic system, axial ratios are $a \neq b \neq c$ and the axial angles are ?
    (a) $\alpha = \beta = \Upsilon \neq 90°$ (b) $\alpha \neq \beta \neq \Upsilon \neq 90°$ (c) $\alpha = \beta = \Upsilon = 90°$ (d) $\alpha \neq \beta \neq \Upsilon = 90°$
16. Which of the following is not an adsorbent?
    (a) Carbon (b) Polymers and resins (c) Clay (d) Dry sponge
17. What do you mean by the term 'Sorption'?
    (a) Attachment (b) Detachment (c) Diffusion (d) thermal Expansion
18. The desorption curve is higher than the adsorption curve?
    (a) True (b) False (c) Negative (d) Positive
19. Which of the following isotherm is applicable to physical adsorption?
    (a) Langmuir (b) BET (c) Freundlich (d) Kisluik
20. Assuming that no ^1H signal can be observed for an aqueous sample, which of the following is most likely not a cause of the problem?
    (a) The cable is not connected to the probe after probe tuning. (b) There is a loose cable connection around the probe
    (c) The sample is not shimmed will (d) The probe has a problem
21. What coil configuration is most likely used for a triple-resonance probe?
    (a) The inner coil is double-tuned to ^1H and ^{13}C
    (b) The ^1H and lock channel use the inner coil, ^{13}c and ^{13}N use the outer coil
    (c) The probe can be used to observe the correlation of ^1H, ^{13}C, ^{15}N, and ^{31}P simultaneously
    (d) One of the two probe coils is used for ^1H, ^{13}C, and ^{15}N, the other for ^2H

22. A mixer is used to
(a) Subtract the frequencies of two input signals (b) Add the frequencies of two input signals
(c) Multiply the frequencies of two input signals (d) Produce IF frequency
23. Which of the following frequencies cannot be an intermediate frequency (IF)?
(a) 20 MHz (b) 10 MHz (c) 30 MHz (d) 200 MHz
24. If the size of the above data set is doubled by zero-filling, what is the digital resolution of the spectrum ?
15.6 Hz/pt (b) 7.8 Hz/pt (c) 3.9 Hz/pt (d) 0.02 ppm/pt
25. (a) Which parameter can saturate the lock signal if it is set too high?
(a) Lock gain (b) lock phase (c) lock power (d) lock field(or $z_\circ$)
26. Assuming that on a 600 MHz NMR spectrometer the ^{13}C 90° pulse length is 15 μs at 60 Db and a higher decibel value means MORE power for a pulse, what is most likely the power setting for ^{13}C GARP decoupling over a 50 ppm bandwidth?
(a) 45 dB (b) 47 dB (c) 49 dB (d) 51 dB
27. Why is DSS used instead of TMS as the ^{1}H chemical shift reference for a biological sample ?
(a) TMS can denature proteins (b) The chemical shift of TMS is dependent on temperature
(c) DSS has a higher solubility in aqueous solution (d) DSS is widely used in protein sample preparation
28. Chemical shifts originate from
(a) Magnetic momentum (b) Electron shielding (c) Free induction decay (d) Scalar coupling (J-coupling)
29. What is the ^{13}C resonance frequency on a 600 MHz NMR spectrometer?
(a) 600 MHz (b) 92 MHz (c) 60 MHz (d) 150 MHz
30. The natural abundance of ^{13}C is about?
(a) Four times less that ^{1}H (b) 0.11% of total carbon (c) 1.1 % of total carbon (d) 99% of total carbon
31. Deuterated solvent in an NMR sample is used to?
(a) Stabilize the magnetic field (b) Set the chemical shift reference
(c) Obtain good field homogeneity across the sample (d) Both (a) and ((c)
32. Certain NMR parameters are measured for the study of protein dynamics. Which of the following parameters is not measured for the protein dynamics?
(a) $^{15}NT_1$relaxation rate (b) ^{1}H-^{1}H NOE (c) ^{1}H-^{15}H NOE (d) $^{15}NT_2$relaxation rate
33. Which of the following is true about value of refractive index of quartz glass?
(a) Small in all directions (b) Different in different directions (c) Cannot be measured (d) Always zero
34. Which of the following conditions favours the existence of a substance in the solid state?
(a) High temperature (b) Low temperature (c) High thermal energy (d) Weak conesive forces
35. Which of the following is an amorphous solid?
(a) Graphite (c) (b) Quartz glass (SiO_2) (c) Chrome alum (d) Silicon carbide (sic)
36. Which of the following is an example of photochemical reaction?
(a) Photosynthesis (b) Decomposition of ammonia (c) Formation of NaOH (d) Decomposition of Hcl
37. The reaction which are caused by heat and in absence of light is called?
(a) Photo chemical reactions (b) Dark reactions (c) Reversible reaction (d) Reversible photo chemical reaction
38. In photo chemical reaction absorption of _____reaction takes place?
(a) Ultraviolet and visible (b) Radio (c) Only visible (d) Visible and x-rays
39. Which of the following is not an adsorbent?
(a) Carbon (b) Polymers (c) Clay (d) Dry sponge
40. What do you mean by the term sorption?
(a) Attachment (b) Detachment (c) Diffusion (d) Thermal expansion
41. Which of the following isotherm is applicable to physical adsorption?
(a) Langmuir (b) BET (c) Freundlich (d) kisluk
42. Calculate the adworption of a dye on activated carbon at 25°C where K=0.025, n=0.5 and c=0.04 based on the freundlich isotherm?
(a) 0.050 (b) 0.030 (c) 0.040 (d) 0.060
43. The smallest respective unit of the crystal structure is known as___?
(a) Atoms (b) compound (c) unit cell (d) lattice
44. For the crystal structures how many numbers of bravis lattice are there?
(a) 3 (b) 6 (c) 14 (d) 24
45. Labelling of the lattice using planes is done by
(a) bragg'sindices (b) miller indices (c) stock Barger (d) Dalton's indices
46. In the diffraction of x-ray by the set of a plane in some cases the resultant intercity is zero there are caused by absent reflections what is the number absent reflection is divided?
(a) 2 (b) 10 (c) 50 (d) 100
47. Which of the following is not characteristic of chemisorption?
(a) It is irreversible (b) It is sceptic (c) It is multiplayer phenomenon (d) Heat of adsorption is about 400kg.
48. Adsorption of methane follows the Langmuir adsorption 150 therm at 90 k If p=1.896 cm^3 g^{-1} bar^{-1} and b=0.146 calculate the value of Θ
(a) 0.116 bar (b) 0.514 bar (c) 0.214 bar (d) 0.216 bar
49. Which of the following is not a favourable condition for physical adsorption?
(a) Negative Δ H (b) Critical temperature of absorb ate (c) High pressure (d) High temperature
50. Each of the following solids shows the frenkeldefect except?
(a) ZnS (b) AgBr (c) AgI (d) KCl