To be filled in ... by ball point pen only

Seal of Superintendent of E...

Roll No.

Declaration : I have read and understood the ins...

Signature of Invigilat...

Full Signature of Can...

Name of Invigilator ......

Name of Candidate

Full Marks : 60
Time : 1½ Hour

Number of Pages
in the Question Booklet } 12

Number of Questions
in the Booklet } 60

POST GRADUATION
Entrance Test Examination, 2019
INSTRUCTION TO CANDIDATES

1. You must follow all the instructions that may be announced by the Superintendent / Invigilators in the Examination Hall.

2. This Booklet contains 12 pages. Please check that all pages are in order before writing Roll No. on the Test Booklet and OMR Sheet.

3. This Booklet contains 60 (sixty) questions of multiple choices with four options like A, B, C & D.

4. While answering the questions please note :
   - The test is of one and half hour duration.
   - A separate OMR sheet containing alternatives and blank circles for each alternative is supplied. Write you Roll No. and other data in the given space provided in the OMR sheet.
   - The answer shall be indicated by blackening an appropriate circle completely in the OMR sheet.
   - Once answered by blackening any of the A/B/C/D options, the candidate is not allowed to make any changes in his/her response.
   - More than one response for the same question would invalidate the answer.
   - One (1) mark shall be awarded for each correct answer and zero (0) for each wrong or unattempted question.

5. The college reserves the right to disqualify any candidate for any length of time, without assigning any reason thereof.

6. You can carry only the following materials with you to the Examination Hall : Admit Card issued to you (Mandatory), Blue or Black Ball Point/Gel Pens, Medicines (if any required), Water bottle (not more than 250ml size).

7. You must not be in possession of Mobile/Cell Phone (s) of any type, Electronic gadgets of any type in the Examination Hall.

8. You must not be in possession of any type of weapon or explosive. Such candidates shall not be allowed entry to Examination Centre under any circumstances.

9. You must not be in intoxicated state. Such candidates shall not be allowed entry to Examination Centre under any circumstances.

10. You must not carry any incriminating material to the Examination Hall.

11. Any infringement of the rules of the Admission Test shall result in total disqualification to Admission into all PG Courses.

12. If there is any writing or special mark at any place in the Test Booklet except in the space for rough work provided at the end of the Test Booklet or in response sheet, the response sheet shall not be valued.

Answer ALL questions.

Follow the instructions to the candidates printed on the cover page of this Booklet strictly.

Answer shall be indicated by blackening an appropriate circle completely in the supplied separate OMR sheet.

1. What is the change in chemical potential when 2 moles of O_2 is transferred from partial pressure of 10 atm to partial pressure of 1 atm at 300K.

   A) 8.028 kJ

   B) 1.729 kJ

   C) 17.29 kJ

   D) 172.9 kJ

2. What is the entropy increase in evaporation of 1 mole of water at 100°C. Heat of vaporisation is 540 calgm^{-1}.

   A) 27.5 cal mol^{-1}deg^{-1}

   B) 1590 J

   C) 26.1 cal mol^{-1}deg^{-1}

   D) 1.447 cal mol^{-1}deg^{-1}

3. Which one is a state function

   A) Q

   B) W

   C) Q+W

   D) Q-W

4. Which is true

   A) $\left(\dfrac{\partial G}{\partial P}\right)_T = V$

   B) $\left(\dfrac{\partial G}{\partial P}\right)_T = S$

   C) $\left(\dfrac{\partial G}{\partial V}\right)_T = P$

   D) $\left(\dfrac{\partial A}{\partial V}\right)_T = P$

5. $NH_4Cl_{(s)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$

   Calculate number of phase, component and degrees of freedom

   A) 2, 3, 3

   B) 3, 2, 0

   C) 3, 3, 3

   D) 2, 2, 2

6. Which one is an Extensive Property ?

   A) Dielectric constant

   B) Gibbs free energy

   C) Specific heat

   D) Viscosity

7. Azotropic mixture are

A) Mixture of two solids

B) Those which boil at different temperatures

C) Those which can be fractionally distilled

D) Constant boiling mixture

8. Which of the following has the highest boiling point

A) 0.1M NaCl

B) 0.1M Urea

C) 0.1M $BaCl_2$

D) 0.1M glucose

9. Kinetic energy of any gas molecule at 0^0C

A) zero

B) 3404j

C) 2 cal

D) 5.66 J

10. The surface tension of which of the following liquid is maximum ?

A) C_2H_5OH

B) CH_3OH

C) H_2O

D) C_6H_6

11. The half life of a first order reaction having rate constant

$k=1.7X10^{-5}sec^{-1}$

A) 12.1 hrs

B) 9.7 hrs

C) 11.3 hrs

D) 1.8 hrs

12. 4 moles of A is mixed with 4 moles of B to form 2 moles of C at equilibrium, according to the reaction,

$A+B \rightleftharpoons C+D$. The equilibrium constant is

A) $\sqrt{2}$

B) 2

C) 1

D) 4

13. Freundlich adsorption isotherm is

A) $\frac{x}{m} = KP^{1/n}$

B) $\frac{x}{m} = mKP^{1/n}$

C) $\frac{x}{m} = KP^{-n}$

D) all of these

14. The solubility product of a sparingly soluble salt Ag_2CrO_4 is $4x10^{-12}$. The molar solubility of the salt

A) $1x10^{-4}$ molL^{-1}

B) $2x10^{-6}$ molL^{-1}

C) $1x10^{-5}$ molL^{-1}

D) $2x10^{-12}$ molL^{-1}

Chem.-4

15. K_p/K_c for the reaction $CO_g + 1/2O_{2(g)} \rightleftharpoons CO_{2(g)}$ is

   A) RT

   B) $1/\sqrt{RT}$

   C) $\sqrt{RT}$

   D) 1

16. If the endothermic reaction occurs spontaneously at constant temperature and pressure, then which of the following is true ?

   A) $\Delta G > 0$

   B) $\Delta H < 0$

   C) $\Delta S > 0$

   D) $\Delta S < 0$

17. The standard electrode potentials of four elements A, B, C and D are –3.05, 1.66, –0.40 and 0.80 volt. The highest chemical activity will be shown by

   A) A

   B) B

   C) C

   D) D

18. The ionic conductance at infinite dilution of silver ion is 61.92×10^{-4} s $m^2 mol^{-1}$ at $25^\circ C$. What is the mobility of silver ion ?

   A) $6.412 \times 10^{-8}\ m^2 v^{-1} s^{-1}$

   B) $3 \times 10^{-7}\ m^2 v^{-1} s^{-1}$

   C) $7.6 \times 10^{-8}\ m^2 v^{-1} s^{-1}$

   D) Zero

19. The Wien effect IS related to speed of ion under

   A) High conductance

   B) High A.C current

   C) High potential gradient

   D) High concentration

20. The lattice structure of

   A) FCC

   B) BCC

   C) HCP

   D) CCP

21. What is the % of volume occupies by atoms in BCC

   A) 58

   B) 68

   C) 32

   D) 88

22. Which of the following exists as covalent crystals in the solid state

   A) Iodine

   B) Silicon

   C) Sulpur

   D) Phosphorus

23. The number of Nacl units present in an unit cell of Nacl

A) 1

B) 2

C) 4

D) 8

24. Which of the following has hcp structure ?

A) Al

B) Mg

C) Cu

D) Ni

25. Frenknel defects is found in crystals in which the radius ratio is

A) Low

B) 1.3

C) 1.5

D) slightly less than unity

26. If the radius ratio of first Bohr orbit is r, the de-Broglie wavelength of electron in 3rd orbit is

A) $2\pi r$

B) $6\pi r$

C) $9r$

D) $r/3$

27. Which has maximum value of mean free path ?

A) CO_2

B) H_2

C) O_2

D) N_2

28. The standard reduction potential for cu^{2+}/cu and cu^{2+}/cu^+ are 0.337v and 0.153v respectively. The standard electrode potential of cu^+/cu half cell is

A) 0.184 V

B) 0.827 V

C) 0.521 V

D) 0.490 V

29. Which of the following solution is used as anti-rusting solution ?

A) Na_2SO_4

B) Na_3PO_4

C) Na_3BO_3

D) Na_2S

30. The orbital angular momentum for a 2p orbital is

A) $\sqrt{3}h/2\pi$

B) $\sqrt{2}h/2\pi$

C) $h/2\pi$

D) $6h/2\pi$

31. What is the uncertainty in the velocity of cricket ball of mass 150 g. If the uncertainty in its position is of the order 1A°.

A) $3.5 \times 10^{-24}ms^{-1}$

B) $6.6 \times 10^{-24}ms^{-1}$

C) $3.752 \times 10^{-32}ms^{-1}$

D) $2.64 \times 10^{-24}ms^{-1}$

Chem.-6

32. What is the pH of 0.002N acetic acid if its 2.3% ionised at a given dilution.

A) 2.0

B) 5.3

C) 4.33

D) 3.85

33. The pH of a buffer solution is 4.745. When 0.01 mole of NaOH is added to 1 ltr of it, the pH changes to 4.832. What is its buffer capacity

A) 0.087

B) 0.115

C) 0.01

D) 1.0

34. What is the pH of buffer solution of 0.1M acetic acid and 0.1M Sodium acetate (pk$_a$=4.745)
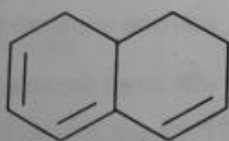
A) 4.745

B) 3.745

C) 5.745

D) 3.255

35. Which one of the following indicators works in the pH range 8-9.8 ?

A) Litmus

B) Methyl red

C) Methyl orange

D) Phenolphthalein

36. How many no. of double bonds are present in $C_3H_8O_3$?

A) 0

B) 2

C) 1

D) 3

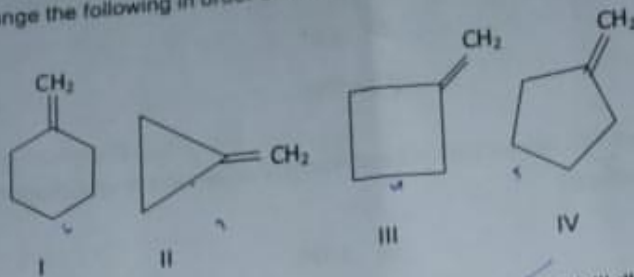37. What is the λ_{max} value for the compound following Woodward rule

A) 234 nm

B) 225 nm

C) 273 nm

D) 259 nm

38. In a carbonyl compound, the increase in polarity of a solvent shifts one of the following transitions to shorter wavelengths

A) $n \to \pi^*$

B) $\pi \to \pi^*$

C) $n \to \sigma^*$

D) $\sigma \to \sigma^*$

Chem.-7

39. Arrange the following in order of increase wave number of absorption.

I II III IV

A) IV>III>II>I

B) I<IV<III<II

C) I>II>III>IV

D) II>III>I>IV

40. The absence of absorption bands near 1600,1580,1500 cm^{-1} is a sure proof of absence of

A) Aromatic ring

B) Carbonyl group

C) OH group

D) Amine group

41. How many NMR signals are formed for 2-chloropropene

A) 2

B) 3

C) 1

D) 4

42. The no. of spectral lines that are possible when electron in 7th shell in different hydrogen atoms returns to 2nd shell.

A) 12

B) 15

C) 14

D) 10

43. $[Cr(NH_3)_6]^{3+}$ is

A) Diamagnetic

B) Paramagnetic with one unpaired electron

C) Paramagnetic with two unpaired electrons

D) Paramagnetic with three unpaired electron

44. $[Fe(H_2O)_6]^{3+}$ is octahedral with

A) d^2sp^3, diamagnetic

B) d^2sp^3, paramagnetic

C) sp^3d^2, paramagnetic

D) sp^3d^2 diamagnetic

45. CFSE in octahedral and tetrahedral field for d^7 system are

A) $-1.2\Delta_o, -0.36\Delta_o$

B) $0, -0.27\Delta_o$

C) $-0.8\Delta_o, -0.54\Delta_o$

D) $-0.36\Delta_o, -1.2\Delta_o$

46. Which
CN⁻, O
A) CN
C) Cr

47. Which
A) O
C) H

48. State
A) O
C)

49. Whic
Ti (in
A)
C)

50. The
A)
C)

1. The
A)
C)

2. Wr
A)
C)

Chem.-8

Which of the following have identical bond order

CN^-, O_2^-, NO^+, CN^+

A) CN^-, O_2^-

B) CN^-, CN^+

C) CN^-, NO^+

D) O_2^-, CN^+

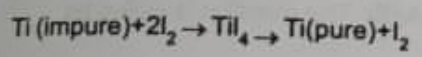Which of the following species can act both as Bronsted acid and as bronsted base.

A) O^{2-}

B) HCl

C) HSO_4^-

D) Na_2CO_3

State the no. of nodes in R(r) plot against r in the following orbitals 2p, 4d, 5f

A) 0, 1, 1

B) 2, 1, 0

C) 1, 1, 1

D) 2, 3, 3

49. Which method of purification represented by the equation

$Ti\ (impure) + 2I_2 \rightarrow TiI_4 \rightarrow Ti(pure) + I_2$

A) Van Arkel

B) Zone refining

C) Cupellation

D) Poling

50. The shape of the compound ClO_3^-

A) Tetrahedral

B) Pyramidal

C) Angular

D) Linear

51. The oil used in the froth flotation process is

A) Coconut oil

B) Olive oil

C) Pine oil

D) Mustard oil

52. Which of the following is Witting reagent ?

A) 2,4 dinitrophenyl hydrazine

B) s-trinitrophenol

C) methylene triphenyl phosphorane

D) Amalgamated zinc and conc. HCl

Chem.-9

When wine is kept in air, it will become sour due to

A) oxidation of ethyl alcohol

B) reduction of ethyl alcohol

C) Formation of ethylamine

D) dissolution of CO_2

C_3H_8O shows how many isomers

A) 2

B) 3

C) 4

D) 5

Which of the following undergoes nucleophilic substitution exclusively by SN^1 mechanism

A) ethyl chloride

B) isopropyl chloride

C) chloro benzene

D) Benzyl chloride

56. An SN^2 reaction at an asymmetric carbon of a compound always gives

A) An enantiomers of substrate

B) a product with opposite optical rotation

C) a mixture of diastereomers

D) A single stereoisomers

57. Methyl bromide reacts with AgF to give methyl fluoride and AgBr. The reaction is called as

A) Frinkel-stein reaction

B) Fitting reaction

C) Swarts reaction

D) Wurtz-Fitting reaction

58. The only amino acid which is non-chiral is

A) Lysine

B) Proline

C) Glycine

D) Histidine

59. When sucrose is heated with conc. HNO_3 in presence of V_2O_5 as catalyst it gives

A) Formic acid

B) Oxalic acid

C) Saccharic acid

D) Dinitrosucrose

60. The reaction involving condensation of acetic anhydride with an aromatic aldehyde by carboxylate ion is an example of

A) Aldol condensation

B) Benzoin condensation

C) Perkins reaction

D) Wurtz reaction

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