CHEMISTRY – PG 2016 Final

1) What is the empirical formula of a compound that contains 72g carbon, 18g hydrogen and 192g oxygen? (The masses of H, C and O are 1, 12 and 16)

A. CH_4O_4

B. CHO

C. CH_3O_2

D. CH_4O_2

2) What kind of orbitals do the nonbonding electrons of the oxygen in an alcohol occupy?

A. They occupy s orbitals
B. They occupy sp^2 orbitals
C. They occupy sp orbitals
D. They occupy sp^3 orbitals

3) Steam distillation would be the appropriate method of distillation for which of the following?

A. Diethyl ether and water
B. Ethyl alcohol and water
C. Aniline and sodium chloride
D. None of these

4) An organic compound (0.2g) containing carbon, hydrogen and oxygen yielded on combustion 0.14g of CO_2 and 0.12g of H_2O. The percentage composition of the compound is

A. C=19.90%, H=6.66%, O=74.24%

B. C=25%, H=1.66%, O=73.34%

C. C=66.7%, H=11.1%, O=22.2%

D. C=30%, H=3%, O=67%

5) Which of the following have lowest dipole moment?

A. Carbon tetrachloride
B. Chloromethane
C. Dichloromethane
D. Chloroform

6) Optical isomerism is shown by

A. *n*-butyl chloride
B. *sec*-butyl chloride
C. *tert*- butyl chloride
D. isobutyl chloride

7) LPG is a mixture of

A. methane+ethane
B. O_2 + Acetylene
C. butane + Isobutane
D. acetylene + H_2

8) Baeyer's reagent is

A. dil $KMnO_4$
B. $HCl + ZnCl_2$
C. Br_2 in CCl_4
D. NH_2NH_2

9) 1,3-butadiene reacts with bromine to mainly give

A. 3,4-dibromo-1-butene
B. 4-bromo-1-butene
C. 1,4-dibromo-2-butene
D. 1-bromo-2-butene

10) Ozonolysis of 2-butyne gives

A. formic acid
B. propanoic acid
C. acetic acid
D. butanoic acid

11) Which compound would react most rapidly in an S_N2 reaction?

A. CH_3CH_2I
B. CH_2=CH-I
C. $(CH_3)_2$ CHI
D. $(CH_3)_3CI$

12) Which compound will give *tert*-butyl alcohol with methyl magnesium bromide?

A. Acetyl chloride
B. Acetone
C. Isopropyl alcohol

D. Acetaldehyde

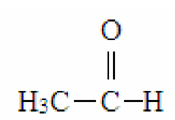
13) Isopropyl alcohol can be converted to acetone by treatment with

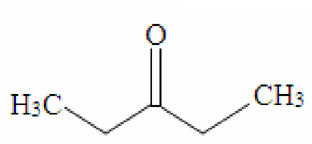
A. $HCl/ZnCl_2$
B. $Na_2Cr_2O_7$ / H_2SO_4
C. NaOH
D. $LiAlH_4$

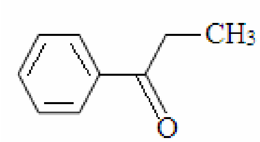
14) Compound (A) reacts with sodium metal to form one mole of H_2. The compound (A) can be

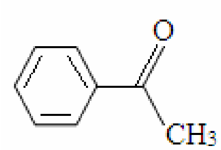
A. $CH_3CH_2CH{=}CH_2$
B. $HOCH_2CH_2CH_2CH_2OH$
C. $CH_2{=}CH\text{-}CH{=}CH_2$
D. $CH_3CH_2CH_2CH_2OH$

15) Compound (A) gave a positive iodoform test, but did not reduce silver metal in ammonia solution. Compound (A) could be

A. 

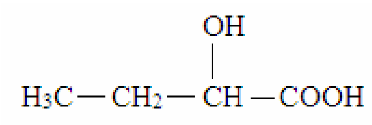
B. 

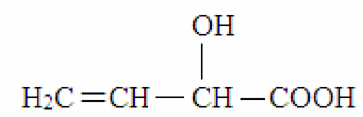
C. 

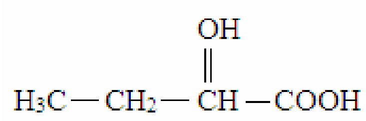
D. 

16) 2-bromobutyric acid $\xrightarrow[\text{reflux}]{\text{NaOH}}$ (A) + NaBr

(A) can be

A. 

B. 

C. 

D. $H_3C-CH_2-CH_2-COOH$

17) Acetamide can be converted to methylamine by

A. P_2O_5

B. PCl_5

C. Br_2/ NaOH

D. $LiAlH_4$

18) Hydrolysis of an ester can be accomplished by

A. base-promoted hydrolysis
B. acid-catalyzed hydrolysis
C. Both of the above
D. Neither of the above

19) Diethyl malonate reacts with urea to give

A. butyric acid
B. barbituric acid
C. glutaric acid
D. mandelic acid

20) The degree of unsaturation of a fat can be determined by means of its

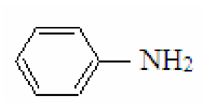
A. iodine number
B. octane number
C. saponification
D. melting point

21) Which of the following compounds react with nitrous acid to form an alcohol?

A. $CH_3CH_2NH_2$

B. $(CH_3CH_2)_2NH$

C. $(CH_3CH_2)_3N$

D. 

22) Glycine reacts with nitrous acid to form

A. glycollic acid
B. diketopiperazine
C. methylamine
D. ethylalcohol

23) Which molecule will decolourize bromine in carbon tetrachloride most readily?

A. 1,2-dimethylcyclopropane
B. Cyclopentane
C. 1,2-dimethylcyclobutane
D. Cyclohexane

24) Uric acid on oxidation with alkaline $KMnO_4$ forms

A. urea
B. barbituric acid
C. allantoin
D. caffeine

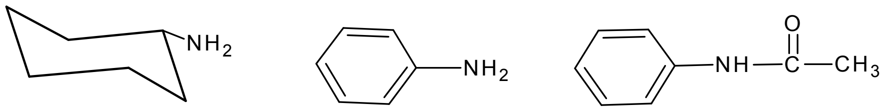
25) α-D-glucopyranose is a (n)

A. hemiacetal
B. hemiketal
C. acetal
D. ketal

26) How many signals will vinyl chloride have in its proton NMR spectrum?

A. 4
B. 1
C. 3
D. 2

27) What is the order of basicity (most basic to least)?



I II III

A. I, II, III
B. I, III, II
C. III, II, I
D. II, I, III

28) Naphthalene undergoes oxidation with $Na_2Cr_2O_7/H_2SO_4$ to form

A. Phthalic acid
B. Benzoic acid
C. Tetralin
D. Decalin

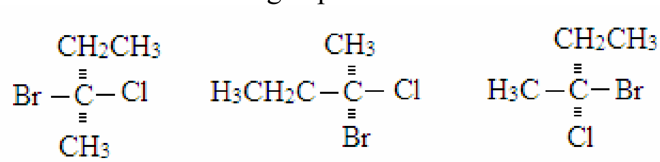
29) The aromaticity of the heterocycles is in the order

A. Thiophene > pyrrole > furan > pyridine
B. Furan > pyrrole > thiophene > pyridine
C. Pyridine > thiophene > pyrrole > furan
D. Pyridine > furan > pyrrole > thiophene

30) The Lindlar catalyst is

A. Na in alcohol
B. Raney nickel
C. Pd / $CaCO_3$
D. Na / LiqNH_3

31) Which of the following depict the same stereoisomer?



1 2 3

A. 1 and 2
B. 1 and 3
C. 2 and 3
D. 1, 2 and 3

32) Rank the following species in order of decreasing nucleophilicity in a polar protic solvent (most → least nucleophilicity).

$CH_3CH_2CH_2O^-$	$CH_3CH_2CH_2S^-$	$CH_3CH_2COO^-$
1	2	3

A. 3 > 1 > 2
B. 2 > 3 > 1
C. 1 > 3 > 2
D. 2 > 1 > 3

33) Which of the following are pyrimidines?

1. Adenine 2. Cytosine 3. Guanine 4. Thymine

A. 1, 2
B. 1, 3
C. 1, 4
D. 2, 4

34) A D carbohydrate is

A. always dextrorotatory
B. always levorotatory
C. always the anomer of the corresponding
D. None of the above

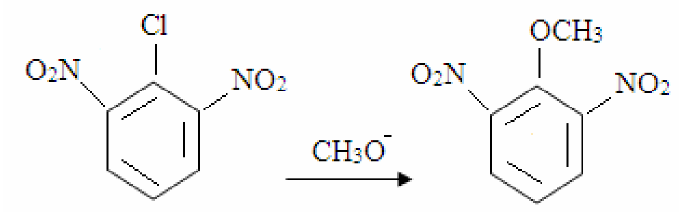
35) The optical rotation of the α-form of a pyranose is +150.7° and that of the β-form is +52.8°. In solution an equilibrium mixture of the anomers has an optical rotation of +80.2°. The percentage of the α-form at equilibrium is

A. 28%
B. 32%
C. 68%
D. 72%

36) Which of the following reactions is more effective?
I. $C_6H_5ONa + CH_3CH_2CH_2Br \rightarrow$
II. $CH_3CH_2CH_2ONa + C_6H_5Br \rightarrow$

A. Reaction I is more effective
B. Reaction II is more effective
C. Both reactions I and II are effective
D. Neither reaction I nor reaction II is effective

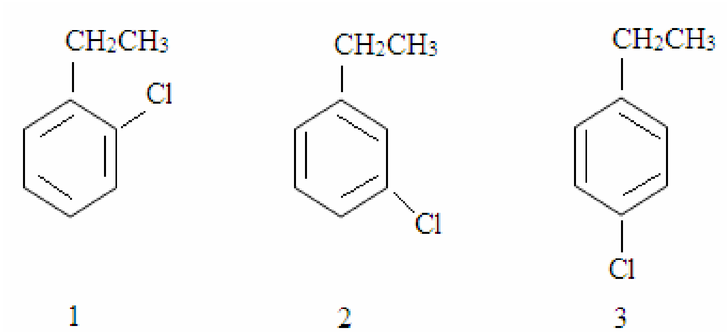
37) The reaction



most likely occurs by which of the following mechanisms?

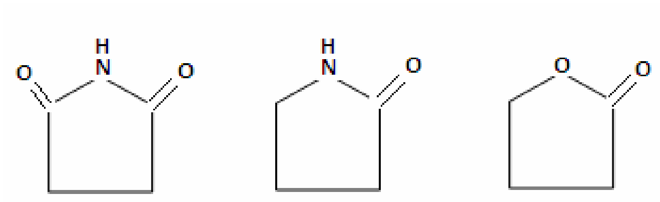
A. Addition - elimination
B. Elimination - addition
C. Both (A) and (B)
D. Neither of these

38) Which of the following compounds gives a single benzyne intermediate on reaction with sodium amide?



A. 1 only
B. 1 and 3
C. 3 only
D. 1 and 2

39) Choose the response that matches the correct functional group classification with the following group of



A.	Anhydride	Lactam	Lactone
B.	Lactam	Imide	Lactone
C.	Imide	Lactone	Anhydride
D.	Imide	Lactam	Lactone

40) Which of the following pairs of aldehydes gives a single product in a mixed aldol condensation?

A. $C_6H_5CH_2CHO + C_6H_5CHO$
B. $C_6H_5CHO + CH_2O$
C. $C_6H_5CHO + (CH_3)_3CCHO$
D. $CH_3CHO + (CH_3)_2CHCHO$

41) Which of the following is a linear polymer?

A. High density polythene
B. Low density polythene
C. Bakelite
D. Vulcanized rubber

42) Bakelite is the product of the reaction between

A. formaldehyde and NaOH
B. aniline and urea
C. phenol and methanol
D. phenol and chloroform

43) Dettol consists of

A. xylenol + terpeneol
B. chloroxylenol + terpeneol
C. cresol + ethanol
D. None of the above

44) Which of the following is an ester?

A. Kerosene oil
B. Soap
C. Bees wax
D. Peptoses

45) Isopropylamine $\longrightarrow$ X $\longrightarrow$ Y. In the above sequence X and Y are respectively

A. Acetaldimine, Ethanol
B. Ethanol, Ketimine
C. Ketimine, Acetone
D. Acetone, Propan-2-ol

46) Green Chemistry means such reactions which

A. are related to the depletion of ozone layer
B. study of reactions in plants
C. produce colour during reactions
D. reduce the use and production of hazardous chemicals

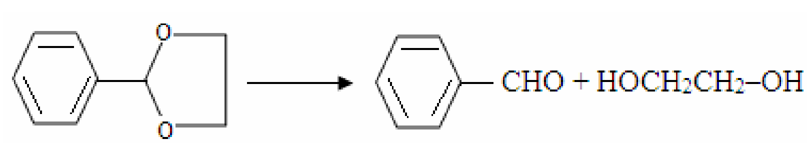
47) The presence of chlorine is indicated in a compound if its mass spectrum, show M^+ and $(M+2)^+$ peaks in the intensity ratio

A. 2:1
B. 3:1
C. 1:1
D. 1:2

48) Infrared region lies between

A. ultraviolet and radiowave
B. visible and radio waves
C. Visible and microwave
D. UV and Visible waves

49) What reagent and/or reaction conditions would you choose to bring about the following conversion?



A. $LiAlH_4$, $2H_2O$
B. H_2O, NaOH
C. H_2O, H_2SO_4
D. PCC, CH_2Cl_2

50) Which of the following alcohols gives the best yield of dialkyl ether on being heated with a trace of sulphuric acid?

A. 1-Pentanol
B. 2-Pentanol
C. Cyclo pentanol
D. 2-Methyl-2-butanol

51) dS = 0 for a

A. Reversible process in an isolated system
B. Reversible process in a closed system

C. Reversible process in an open system
D. Irreversible process in an isolated system

52) Dispersion of liquid into a gas is called

A. sol
B. aerosol
C. emulsion
D. gel

53) Choose the correct statement:
The enthalpy of mixing for perfect gas

A. $\Delta_{mix}H = 0$

B. $\Delta_{mix}H = 1$

C. $\Delta_{mix}H = <1$

D. $\Delta_{mix}H = >1$

54) Match the following:

Molecule	Point group
(I) H_2O	(i) T_d
(II) CH_3Cl	(ii) D_{2h}
(III) C_2H_4	(iii) C_{3v}
(IV) CH_4	(iv) C_{2v}

A. (I) - (iv), (II) - (iii), (III) - (ii), (IV) - (i)
B. (I) - (ii), (II) - (i), (III) - (iv), (IV) - (iii)
C. (I) - (iii), (II) - (i), (III) - (iv), (IV) - (ii)
D. (I) - (iv), (II) - (ii), (III) - (i), (IV) - (iii)

55) Choose the molecule(s) with a center of symmetry
(I) SF_6 (II) CO_2 (III) XeF_4 (IV) H_2O

A. I, II and III only
B. IV only
C. III and IV only
D. I and IV only

56) Einstein temperature of solid, θ_E, is equal to

A. $\hbar$ /kT
B. $\hbar$
C. $\hbar$ /k
D. PV

(where k is Boltzmann constant)

57) Match the following:

	List I		List II
I)	Total number of characteristic operations	(i)	Symmetry element
II)	Sum of diagonal elements	(ii)	Identity
III)	Doing nothing	(iii)	Character
IV)	The point, line or plane with	(iv)	Order of the point group

A. (I)-(iv), (II)-(iii), (III)-(ii), (IV)-(i)
B. (I)-(ii), (II)-(iv), (III)-(i), (IV)-(iii)
C. (I)-(ii), (II)-(i), (III)-(iii), (IV)-(iv)
D. (I)-(i), (II)-(iii), (III)-(iv), (IV)-(ii)

58) The entropy is ___________if there is only one way of achieving a given total energy

A. One
B. Zero
C. >1
D. Infinity

59) A reaction is thermodynamically feasible if

A. $\Delta_r G^\theta < 0$

B. $\Delta_r G^\theta > 0$

C. $\Delta_r G^\theta = 0$

D. $\Delta_r G^\theta = 1$

60) Number of orbitals in a shell with n=5 (where n is the principal quantum number) is

A. 25
B. 5
C. 125
D. 3

61) Which one of the following statements is not true?

A. Ice has a residual entropy of 3.4 J K^{-1} mol^{-1}
B. The osmotic pressure of a solution is proportional to the concentration of the solute
C. An ideal solution is one in which the solute obeys Henry's law
D. All heteronuclear diatomic molecules are nonpolar

62) If a system can exchange matter with the surroundings, it is called

A. open system
B. closed system
C. isolated system
D. metastable system

63) Which one of the following statements is not true?

A. Bosons are particles with half integral spin.
B. The stiffer the bond, the greater is the force constant.
C. Unit of pressure is pascal.
D. Normal value of the pH of the human blood plasma is 7.4.

64) Heat capacity is defined as

A. C = dS/dT
B. C = dq/dT
C. C = dq
D. C = RT

65) The ideal gas constant, R, is equal to

A. 8.314 cal mol^{-1}
B. 8.314 J K^{-1} mol^{-1}
C. 8.314 J $^{o}C^{-1}$ mol^{-1}
D. 2 J K^{-1} mol^{-1}

66) Which one of the following statements is not true?

A. Gold at the nanoscale is red.
B. $C_P - C_V = nR$
C. e^- is a Fermion.
D. IR inactive vibration in CO_2 is bending vibration.

67) Possible quantum states for a carbon atom with the configuration $1s^2\ 2s^2\ 2p^2$

A. 12
B. 6

C. 15
D. 9

68) Stirling's approximation is

A. ln X! ; X ln X–X
B. ln X! ; X ln X
C. ln X! ; X ln X + X
D. ln X! ; X

69) Unit of partition function is

A. dimensionless
B. s^{-1}
C. D
D. K^{-1}

70) Boltzmann's constant, k, is equal to

A. ideal gas constant
B. ideal gas constant × Avogadro's number
C. ideal gas constant / T
D. ideal gas constant / Avogadro's number

71) Number of IR active normal modes of H_2O molecule is

A. three
B. two
C. one
D. None of the above

72) Match the following:

Acids	pKa (at 25ºC)
I) Acetic acid	(i) 3.75
II) Formic acid	(ii) 6.49
III) Chromic acid	(iii) 1.64
IV) Periodic acid	(iv) 4.76

A. (I)-(i), (II)-(iv), (III)-(ii), (IV) - (iii)
B. (I)-(ii), (II)-(i), (III)-(iv), (IV) - (iii)
C. (I)-(iii), (II)-(iv), (III)-(i), (IV) - (ii)
D. (I)-(iv), (II)-(i), (III)-(ii), (IV) - (iii)

73) Pick out the nuclei having spin, I = 1

(I) ^{1}H (II) ^{2}D (III) ^{14}N (IV) ^{19}F

A. (II) and (III) only
B. (I) only
C. (IV) only
D. (I) and (IV) only

74) ___________ is known as dry ice.

A. Solid CO_2
B. H_2O_2
C. Phenol
D. NH_4Br

75) Choose the correct statement(s)

(I) An ensemble is defined as a collection of identical units of a system.
(II) Exponent is unitless.
(III) Absorbance, A=log I_0
(IV) In fluorescence, the spontaneous emission may persist for long periods.

A. (I) and (II) only
B. (III) and (IV) only
C. (III) only
D. (IV) only

76) Best catalyst for NH_3 synthesis is

A.Mo
B. Ni
C. Fe
D. None of the above

77) The number of vibrational degrees of freedom for a nonlinear polyatomics are

A. 3N-6
B. 3N
C. 3N-5
D. 3N+6

78) The coordination number of a primitive cubic lattice is

A. 4
B. 8
C. 6

D. 9

79) Unit of molar absorption coefficient, ε , is

A. s^{-1}
B. $dm^3\ mol^{-1}$
C. $dm^3\ mol^{-1}\ cm^{-1}$
D. $kJ\ mol^{-1}$

80) The bond order of NO is

A. 2 ½
B. 2
C. 1
D. 3

81) Pick out Boson(s) from the following:

(I) ^2H (II) ^4He (III) 1^4N (IV) Photon

A. All four
B. None
C. (I) only
D. (II) Only

82) Selection rule for rotational transition is

A. $\Delta J = \pm 1$
B. $\Delta J = \pm 2$
C. $\Delta J = 0$
D. $\Delta J = \pm 3$

83) S branch lines arise from ___________ transition (Raman spectra)

A. $J \rightarrow J+1$
B. $J \rightarrow J$
C. $J \rightarrow J+2$
D. $J \rightarrow J - 1$

84) The root mean square velocity is

A. 3kT
B. 3kTm
C. $(3kT/m)^{1/2}$
D. $(m /3kT)^{1/2}$

85) Spectral region of rotation of polyatomic molecules is

A. Microwave
B. UV
C. Infrared
D. Visible

86) Pick out the microwave active molecule

A. HCl
B. CH_4
C. H_2
D. SF_6

87) Match the following:

Bond	Bond Length (A^o)
I) C – C	(i) 1.09
II) C = C	(ii) 1.20
III) C ≡ C	(iii) 1.34
IV) N ≡ N	(iv) 1.54

A. (I) – (i), (II) – (ii), (III) – (iv), (IV) – (iii)
B. (I) – (ii), (II) – (iii), (III) – (iv), (IV) – (i)
C. (I) – (iii), (II) – (iv), (III) – (i), (IV) – (ii)
D. (I) – (iv), (II) – (iii), (III) – (ii), (IV) – (i)

88) Pick out the polar molecule(s) from the following:
(I) HCl (II) O_3 (III) NH_3 (IV) CO_2

A. I, II and III only
B. IV only
C. I and II only
D. II and IV only

89) Match the following:

Region	Molecular Process
(I) Microwave	(i) Vibration of flexible bonds
(II) Far IR	(ii) Electronic transitions
(III) IR	(iii) Rotation of small molecules
(IV) Visible & UV	(iv) Rotation of polyatomic molecule

A. (I) – (iv), (II) – (iii), (III)- (i), (IV) – (ii)
B. (I) – (iii), (II) – (iv), (III)- (ii), (IV) – (i)

C. (I) – (ii), (II) – (iv), (III)- (iii), (IV) – (i)
D. (I) – (i), (II) – (ii), (III)- (iv), (IV) – (iii)

90) Match the following:

Vibration Type	$\bar{v}$ /cm^{-1}
I) $C \equiv C$ stretch	(i) 700-1250
II) $C = O$ stretch	(ii) 1640 – 1780
III) C - C stretch, bend	(iii) 2100-2260
IV) Hydrogen bonds	(iv) 3200-3570

A. (I) - (iii), (II) - (ii), (III) - (i), (IV) - (iv)
B. (I) - (iii), (II) - (iv), (III) - (ii), (IV) - (i)
C. (I) - (ii), (II) - (iv), (III) - (iii), (IV) - (i)
D. (I) - (i), (II) - (ii), (III) - (iv), (IV) - (iii)

91) Dipole moment of CCl_4 is

A. Zero
B. 1.85
C. 1.08
D. 0.45

92) Variance is

A. Equal to standard deviation
B. Average value
C. Square root of the standard deviation
D. Square of the standard deviation

93) Which one of the following statements is not true?

A. The freezing temperature when the pressure is 1atm is called the normal freezing point.
B. Charge on a proton is equal to 1.6022×10^{-19} C.
C. Vibrational energy levels are equally or evenly spaced.
D. The conductivity of a metallic conductor increases as the temperature is raised.

94) Calculate the height of column of water that exerts same pressure as a column of mercury of 760 mm height (density of mercury = 13.6g/cm^3).

A. 1.05m
B. 5.25m
C. 10.3m
D. 8.3m

95) A balloon inside a room, where the temperature is 27^{o}C has a volume of 2.00L. What will its volume be outdoors, where the temperature is –23^{o}C (Assume no change in the gas pressure).

A. 1.20 L
B. 1.67 L
C. 4.80 L
D. 2.40 L

96) How much heat does it take to raise the temperature of 225g water from 25.0 to 100.0^{o}C?

A. 70.5 kJ
B. 40.37 kJ
C. 58.5 kJ
D. 705.00 J

97) For the reaction A$\rightarrow$ products a plot of [A] versus time is found to be a straight line. The order of the reaction is

A. first
B. second
C. zero
D. impossible to determine from the graph

98) The reaction $2A+B \rightarrow C+2D$ is first order in A and first order in B. For this reaction

A. rate of reaction = $k[A]^2[B]$
B. rate of reaction = $k[A]^2$
C. rate of disappearance of A = rate of disappearance of B
D. rate of formation of C = –(rate of disappearance of B)

99) The first order reaction has a half life of 13.9 mm. The rate at which the reaction proceeds when [A] = 0.40 M is

A. 0.020 M min^{-1}
B. 8.0 M min^{-1}
C. 0.050 M min^{-1}
D. 0.125 M min^{-1}

100) Which of the following is most likely to lead to the complete precipitation of a metal ion as its sulphide from a saturated solution of H_2S?

A. Add an acid
B. Increase the [H_2S] in the solution
C. Raise the pH
D. Heat the solution

101) A body mass of 10 mg is moving with a velocity of 100 ms^{-1}. The wavelength of the deBroglie wave associated with it would be

A. 6.63×10^{-37} m
B. 6.63×10^{-31} m
C. 6.63×10^{-34} m
D. 6.63×10^{-35} m

102) Which of the following is used as moderator in nuclear reactors?

A. Cadmium
B. Heavy water
C. Uranium
D. Boron

103) If MX_3 is T shaped, then the lone pair around M is

A. 2
B. 0
C. 3
D. 5

104) Which of the following is amphoteric oxide?

A. CO

B. N_2O

C. Al_2O_3

D. P_4O_{10}

105) XeF_6 on reaction with CsF gives

A. $[XeF_5]^+[CsF_2]^-$

B. XeF_8

C. $[XeF_4]^{2+}[CsF_3]^{2-}$

D. $Cs^+[XeF_7]^-$

106) The oxidation number of Pt in $[Pt(C_2H_4)Cl_3]^-$ is

A. +1
B. +2
C. +3
D. +4

107) An example of a molecule with 3center–2 electron band is

A. XeF_2

B. B_2H_6

C. ICl_2

D. BF_4

108) Which of the following gives red precipitate with $AgNO_3$?

A. KI

B. K_2CrO_4

C. NaBr

D. $NaNO_3$

109) When a substance A reacts with water, it produces a combustible gas B and a solution of substance C in water. When another substance D reacts with this solution of C, it also produces the same gas B on warming but D can produce gas B on reaction with dilute sulphuric acid at room temperature. A imparts a deep golden yellow colour to a smokeless flame of Bunsen burner. A, B, C and D respectively are

A. Na, H_2, NaOH, Zn

B. K, H_2, KOH, Al

C. Ca, H_2, $Ca(OH)_2$, Sn

D. CaC_2, C_2H_2, $Ca(OH)_2$, Fe

110. If 3.22 g of $Na_2SO_4.nH_2O$ on heating expels 1.80 g of water to give the anhydrous salt, then its molecular formula is

A. $Na_2SO_4 \cdot H_2O$

B. B. $2Na_2SO_4 \cdot H_2O$

C. $Na_2SO_4 \cdot 10H_2O$

D. $3Na_2SO_4 \cdot 4H_2O$

111. The order of polarity of bonds, shown by a dash is

A. H-Cl > H-OH > H-NH_2
B. H-OH > H-Cl > H-NH_2
C. H-Cl > H-NH_2 > H-OH
D. H-OH > H-NH_2 > H-Cl

112. The first four ionization energies of an element are 288, 412, 650 and 3220 kJ/mol respectively. The number of valence electrons present in the element is

A. 1
B. 2
C. 3
D. 4

113. The correct order of the first ionization energies of C, N, O and F is

A. C < N < O < F
B. F < N < O < C
C. O < F < N < C
D. C < O < N < F

114. The common isotopes of carbon are ^{12}C (98.9%) and ^{13}C (1.1%). The atomic mass of naturally occurring carbon is

A. 12.50 u
B. 13.00 u
C. 12.00 u
D. 12.01 u

115. The boiling points of H_2O, H_2S and H_2Se are in the order

A. $H_2O < H_2S < H_2Se$
B. $H_2O > H_2S < H_2Se$
C. $H_2O > H_2S > H_2Se$
D. $H_2S > H_2O > H_2Se$

116. The radii of hydrated ions is in the order

A. $Rb^+ > K^+ > Na^+ > Li^+$
B. $Li^+ > Na^+ > K^+ > Rb^+$
C. $Na^+ > K^+ > Rb^+ > Li^+$
D. $Rb^+ > Na^+ > K^+ > Li^+$

117. In the graph of atomic number vs. ionization energy for the elements through Na to Ar,

A. maxima occur at Mg and S
B. maxima occur at Mg and P
C. maxima occur at Na and P
D. maxima occur at Na and S

118. In the series, O^{2-}, F^{-}, Na^{+} and Mg^{2+}, the ionic radii varies in the order

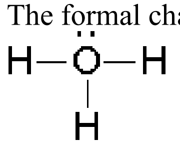
A. $O^{2-} > F^{-} > Na^{+} > Mg^{2+}$

B. $O^{2-} < F^{-} > Na^{+} < Mg^{2+}$

C. $O^{2-} > F^{-} < Na^{+} > Mg^{2+}$

D. $O^{2-} = F^{-} = Na^{+} = Mg^{2+}$

119. The formal charge on oxygen in the species



is

A. –2
B. –1
C. +1
D. +3

120. Both the structures, (a) and (b) of CO_2 given below satisfy the octet rule.

The better structure between them and the reason for that is

A. (a); there is no formal charge on any atom.
B. (a); all the electron pairs are symmetrically arranged.
C. (b); sum of the single and triple bond energies is greater than the sum of the two double bond energies.
D. (b); the two oxygens carry opposite formal charges and hence attract each other.

121. Which one of the following properties is not the characteristic of alkali metals?

A. Low I E
B. Low electronegativity
C. Outermost ns^1 electronic configuration
D. Low atomic volume

122. According to the VSEPR theory, the structures of PF_5 and BrF_5 are respectively

A. TBP and SP
B. SP and TBP
C. TBP and TBP
D. SP and SP

123. The number of bond pairs and lone pairs present in the molecules, (a) BF_3 and (b) PF_3 are,

A. (a) 3, 1; (b) 3,1

B. (a) 3, 0; (b) 3,1

C. (a) 1, 0; (b) 3,1

D. (a) 3, 0; (b) 3,0

124. The hybridisations and the geometries of XeF_4 and SF_4 are respectively,

A. sp^3d^2, octahedral and sp^3, tetrahedral

B. sp^3d^2, octahedral and sp^3d, see-saw

C. sp^3d^2, square planar and sp^3, tetrahedral

D.sp^3d^2, square planar and sp^3d, see-saw

125. In which of the following the O-N-O bond angle is the highest?

A. N_2O_4

B. NO_2^+

C. NO_2^-

D. NO_3^-

126. The order of screening effect of electrons in the inner orbitals of an atom on the outer most electrons is

A. s > p > d > f

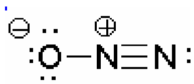
B. s > d > p > f

C. p > d > f > s

D. d > f > p > s

127. Which of the following represents the best resonance structure for N_2O?

A.

B. 

C.

D.

128. Among H_2O, PF_5, BrF_5 and BF_3, the molecules with zero dipole moment are

A. BrF_5 and BF_3

B. PF_5 and BrF_5

C. PF_5 and BF_3

D. BF_3 and H_2O

129. The strongest Bronsted base among $H_2PO_4^-$, HSO_4^-, NO_3^- and CH_3COO^- is

A. $H_2PO_4^-$

B. HSO_4^-

C. CH_3COO^-

D. NO_3^-

130. Among O_2, N_2, NO, NO^+, O_2^+ and O_2^{2-}, the species having the same bond orders are

A. O_2, NO,

B. N_2, NO^+

C. N_2, O_2^{2-}

D. NO^+, O_2^+

131. Which of the following reactions of xenon compounds is not feasible?

A. $3XeF_4 + 6H_2O \rightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$

B. $XeO_3 + 6HF \rightarrow XeF_6 + 3H_2O$

C. $2XeF_2 + 2H_2O \rightarrow 2Xe + 4HF + O_2$

D. $XeF_6 + RbF \rightarrow Rb\,[XeF_7]$

132. When Br_2 reacts with hot concentrated KOH, the oxidation numbers of bromine in the products changes as

A. 0 to –1 and 0 to +3
B. 0 to –1 and 0 to +5
C. 0 to –1 and 0 to +7
D. 0 to +3

133. The most acidic and the least acidic among P_2O_5, As_2O_3, Sb_2O_3 and Bi_2O_3 are respectively,

A. P_2O_5, As_2O_3

B. P_2O_5, Bi_2O_3

C. Bi_2O_3, P_2O_5

D. Bi_2O_3, P_2O_5

134. Which among the following compounds would have optical isomers?
I : cis-$[Co(en)_2Cl_2]^+$, **II**: trans-$[Co(en)_2Cl_2]^+$, **III** :$[Pt(NH_3)_2Cl_2]$ and
IV: $[Ni(CO)_2(PPh_3)_2]$.

A. Both I and II
B. both I and III
C. All the four
D. I only

135. The order of CFSEs for octahedral complexes of Cr(III) with I^-, H_2O, NH_3 and CN^- are in the order,

A. $CN^- < H_2O < NH_3 < I^-$

B. $CN^- < H_2O < I^- < NH_3$

C. $I^- < H_2O < NH_3 < CN^-$

D. $I^- < NH_3 < H_2O < CN^-$

136. The complex $[Ma_4bc]$ can exist as cis- and trans-isomer. Which one of them will give three isomeric products by replacing a ‘a’ ligand by ‘c’? (a, b and c are monodentate ligands).

A. cis-only
B. trans-only
C. both cis- and trans
D. none of them

137. Identify the not true statement among the following:

A. $[CoF_6]^{3-}$: octahedral and paramagnetic
B. $[NiCl_4]^{2-}$: square planar and diamagnetic
C. $[Ni(CN)_4]^{2-}$: square planar and diamagnetic
D. $[CuCl_4]^{2-}$: square planar and paramagnetic

138. In which of the following compounds, the formal oxidation state and coordination number of Co are, respectively, –1 and 4?

A. $Co_2(CO)_8$

B. $MeCo(CO)_4$

C.$NaCo(CO)_4$

D. $Co_4(CO)_{12}$

139. The increasing order of magnetic moments of I: $[Fe(CN)_6]^{4-}$, II: $[Fe(CN)_6]^{3-}$, III: $[CrCl_6]^{3-}$ and IV: $Ni(H_2O)_6]^{2+}$ is

A. I < II < III< IV
B. I < II < IV < III
C. IV < III < I < II
D. II < III< I < IV

140. Which one of the following pairs of isomers and types of isomerism are correctly matched?

(I) $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$– linkage

(II) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt(NH_3)_4][CuCl_4]$ – coordination

(III) $[Pt(NH_3)_4Cl_2]SO_4$ and $[Pt(NH_3)_4Cl_2]Br_2$– ionization

A. (II) and (III)

B. (I), (II) and (III)

C. (I) and (II)

D. (I) and (III)

141. Which one of the following combinations is likely to yield a stable molecule of the type XY_7?

A. X = F, Y = I
B. X = Cl, Y = F
C. X = Br, Y = Cl
D. X = I, Y = F

142. The number of P-O-P bridges in P_4O_6 and P_4O_{10} are respectively,

A. 4, 4
B. 4, 6
C. 6, 4
D. 6, 6

143. Identify the isostructural pairs among the following: NF_3, NO_3^-, H_3O^+, I_3^- and BF_3.

A. [NF_3, NO_3^-] and [H_3O^+ and BF_3]

B. [NF_3, H_3O^+] and [$NO_3^-$and BF_3]

C. [NF_3, BF_3] and [$NO_3^-$and I_3^-]

D. [NF_3, NO_3^-] and [$BF_3$and I_3^-]

144. For a transition metal ion having eight electrons in its d-orbitals, the spin-only magnetic moment (in B M) will be

A. $\sqrt{18}$

B. $\sqrt{8}$

C. $\sqrt{9}$

D. $\sqrt{10}$

145. The E^0 values for Ag^+/Ag, K^+/K, Mg^{2+} /Mg and Cr^{3+}/Cr are 0.80V, –2.93V, –2.37V and –0.74 V respectively. The reducing power of the metals is in the order

A. Ag > Cr > Mg > K

B. K>Mg>Cr>Ag

C. Ag > Cr > K > Mg

D. Cr > Ag > Mg > K

146. Metallic copper and iron have respectively FCC and BCC structures at room temperature. The coordination numbers of Cu and Fe in their structures are

A. Cu : 12 and Fe : 8
B. Cu : 8 and Fe : 12
C. Cu : 6 and Fe : 8
D. Cu : 6 and Fe : 6

147. Which of the following are peroxo acids of suphur?

A. H_2SO_5 and $H_2S_2O_8$

B. H_2SO_5 and $H_2S_2O_7$

C. $H_2S_2O_8$and $H_2S_2O_7$

D. $H_2S_2O_6$ and $H_2S_2O_7$

148. The atomicity and the total number of bonds in elemental white phosphorus molecule are, respectively

A. 4 and 6
B. 6 and 4
C. 4 and 4
D. 6 and 6

149. Which one of the following does not obey 18-electron rule?

A. $[Fe(CO)_5]$

B. $[Cr(CO)_5]^{2-}$

C. $[Mn(CO)_6]^{+}$

D. $[V(CO)_6]$

150. If the CFSE for an octahedral complex ML_6 is 20000 cm^{-1}, then the CFSE of the tetrahedral complex, ML_4 will be approximately

A. 20000 cm^{-1}

B. 15000 cm^{-1}

C. 9000 cm^{-1}

D. 45000 cm^{-1}

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