SOLUTIONS & ANSWERS FOR KERALA ENGINEERING ENTRANCE EXAMINATION-2011
VERSION – A1

[PHYSICS & CHEMISTRY]

1. Ans: 6%

Sol: $\frac{\Delta\rho}{\rho} = \frac{\Delta m}{m} + \frac{\Delta V}{V}$

$= \frac{0.05}{5}\times 100 + \frac{0.05}{1}\times 100$

$= 6\%$

2. Ans: MLT^{-1} and MLT^{-4}

Sol: According to principle of homogeneity

$[MLT^{-2}] = aT^{-1}$

$\therefore a = [MLT^{-1}]$

$[MLT^{-2}] = bT^{2}$

$\therefore b = [MLT^{-4}]$

3. Ans: 30 km h^{-1}

Sol: Average velocity = 40 km h^{-1}

$\frac{2v_1v_2}{v_1+v_2} = 40$

$\frac{2\times 60\times v_2}{60+v_2} = 40$

Solving v_2 = 30 km h^{-1}

4. Ans: 8 s

Sol: $48 + \frac{1}{2}at^2 = 10\ t$

$48 + \frac{1}{2}t^2 = 10$

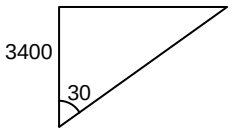
Solving, t = 8 s

5. Ans: $\sqrt{\frac{u^2+v^2}{2}}$

Sol: Standard results.

6. Ans: 196.3 m s^{-1}

Sol:



$\tan 30 = \frac{10\,v}{3400}$

$v = \frac{340}{\sqrt{3}}$ = 196.3 m s^{-1}

7. Ans: 30°

Sol: $H_1 = H_2$

$u_1^2 \sin^2 45 = u_2^2 \sin^2\theta$

$\sin^2\theta_2 = \frac{u_1^2}{u_2^2}.\sin^2 45$

$= \frac{1}{2}.\frac{1}{2}$

$\sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$

8. Ans: $\sqrt{\frac{a}{2b}}$

Sol: $y = bx^2$

$\Rightarrow \frac{dy}{dt} = 2bx\frac{dx}{dt}$ —(i)

$\frac{dy}{dt} = at$ ($\Theta\ v_y = u_y + a_yt$)

$\Rightarrow at = 2bx\frac{dx}{dt}$

$\Rightarrow atdt = 2bx\,dx$

$\Rightarrow \int at\,dt = \int 2bx\,dx$

$\frac{at^2}{2} = bx^2 + c$ —(ii)

At, t = 0, x = 0 $\Rightarrow$ c = 0

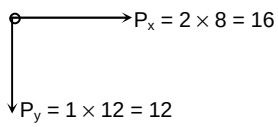
(ii) $\Rightarrow \frac{at^2}{2} = bx^2$

$\Rightarrow x = \sqrt{\frac{at^2}{2b}} = \sqrt{\frac{a}{2b}}t$

$\therefore v_x = \frac{dx}{dt} = \sqrt{\frac{a}{2b}}$

9. Ans: 40 m s^{-1}

Sol:



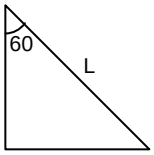
Momentum of third piece = p

$= \sqrt{16^2 + 12^2} = 20$

Velocity = $\frac{p}{m} = \frac{20}{0.5}$ = 40 m s^{-1}

10. Ans: 2 : 1

Sol:



$L = \frac{1}{2} g \cos 60\, t_1^2$

$L\cos\theta = \frac{1}{2} g\ t_2^2$

$\frac{t_1^2}{t_2^2} = \frac{1}{\cos^2 60} = 4$

$t_1 : t_2 = 2 : 1$

11. Ans: 20 m s^{-1}

Sol: $v = \sqrt{gr} = \sqrt{10 \times 40} = 20$ m s^{-1}

12. Ans: $\frac{2mg(h+x)}{x^2}$

Sol: $mg(h + x) = \frac{1}{2} kx^2$

Solving

$k = \frac{2mg(h+x)}{x^2}$

13. Ans: 25

Sol: $\frac{mg(2-1.5)}{mg.2} \times 100 = 25\%$

14. Ans: The potential energy of the particle is zero.

Sol: In horizontal plane PE remains constant equal to zero, assuming surface to be the zero level.

15. Ans: $\sqrt{gh}$

Sol: $v^2 = \frac{2gh}{1+\frac{k^2}{r^2}}$ for ring $k^2 = r^2$

$= \frac{2gh}{2} = gh$

$v = \sqrt{gh}$

16. Ans: $\frac{L}{4}$

Sol: $L^2 = 2\ KI = 2K\frac{L}{\omega}$

$L = \frac{2K}{\omega}$

$L' = \frac{2\left(\frac{K}{2}\right)}{2\omega} = \frac{L}{4}$

17. Ans: $\frac{20}{9}$ m

Sol: $a = \left(\frac{m_2 - m_1}{m_1 + m_2}\right) g = \frac{10}{3}$

$S = \frac{1}{2} at^2 = \frac{20}{3}$

$M_X = \frac{2 \times \frac{20}{3} - 1 \times \frac{20}{3}}{3} = \frac{20}{9}$

18. Ans: 1.36%

Sol: $B = \frac{P}{\frac{\Delta V}{V}}$

$\frac{\Delta V}{V} = \frac{P}{B} = \frac{\rho gh}{B}$

Substituting = 1.36%

19. Ans: 1 : 8

Sol: $T^2 \propto R^3$

$\frac{T_1^2}{T_2^2} = \left(\frac{R}{4\ R}\right)^3$

$\frac{T_1}{T_2} = \frac{1}{8}$

20. Ans: $\sqrt{3} \times 11.2$ km s^{-1}

Sol: $KE = \frac{1}{2} mv^2 - \frac{1}{2} m \times (11.2)^2$

$= \frac{1}{2} m(2 \times 11.2)^2 - \frac{1}{2} m \times (11.2)^2$

$\frac{1}{2} mV^2 = 3 \times \frac{1}{2} m \times 11.2^2$

$V = \sqrt{3} \times 11.2$ km s^{-1}

21. Ans: 0.1 m s^{-1}

Sol: $v = \frac{2}{9} \frac{(\rho - \sigma) r^2 g}{\eta} \propto (\rho - \sigma)$

$\frac{v_1}{v_2} = \frac{\rho_1 - \sigma}{\rho_2 - \sigma} = 0.1$

22. Ans: $\frac{a}{\sqrt{2\pi}}$

Sol: $v^2 = \rho g x$

$a^2\sqrt{\rho g x} = \pi r^2\sqrt{\rho g x}\times 2$

$r = \frac{a}{\sqrt{2\pi}}$

23. Ans: Liquid in B increases.

Sol: Let M gram of ice is floating in liquid of density 1.2. Its displaced volume is $\frac{m \text{ c.c}}{1.2} < m \text{ c.c}$.

When it melts it occupies mcc

24. Ans: Alloys have larger values of Young's modulus than metals.

Sol: Knowledge based.

25. Ans: 600 K

Sol: $\frac{T_1 - T_2}{T_1} = 0.4$

$T_1 - T_2 = 0.4\ T_1$

$T_2 = 0.6\ T_1$

$\frac{T_1' - T_2}{T_1'} = 0.5$

$T_1' = \frac{0.6}{0.5} T_1 = 600$ K

26. Ans: $\frac{7}{5}$

Sol: $C_P = \frac{7}{2}R$

$C_V = \frac{5}{2}R$

$\therefore r = \frac{C_P}{C_V} = \frac{7}{5}$

27. Ans: Isochoric process

Sol: $W = 0$

$\therefore dV = 0$

$\therefore V =$ constant

28. Ans: 80 °C

Sol: $\frac{1}{2}\times\frac{1}{2}mv^2 = \frac{1}{4}m\times 4\times 10^4$

$= 125 \times \Delta T \times m$

$\Delta T = \frac{4\times 10^4}{500} = 80$ °C

29. Ans: 6.25 cm

Sol: $T = 2\pi\sqrt{\frac{m}{K}}$

$mg = Kx$

Solving $x = 6.25$ cm

30. Ans: 3^3

Sol: $A = A_0 e^{\frac{-bt}{2m}}$

$\therefore$ Amplitude becomes $\frac{1}{27}$ times after 6 seconds

31. Ans: 1 : 2

Sol: $mg = 2K x_A = K x_B$

$\frac{x_A}{x_B} = \frac{1}{2}$

$\frac{W_A}{W_B} = \frac{F x_A}{F x_B} = \frac{1}{2}$

32. Ans: 2 : 1

Sol: $\frac{\upsilon_0}{\upsilon_c} = \frac{\frac{v}{2\lambda}}{\frac{v}{4\lambda}} = 2$

33. Ans: $\sqrt{\frac{P}{\rho}}$

Sol: $c = \sqrt{\frac{\gamma P}{\rho}}$

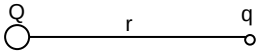
34. Ans: No correct answer. Data is inconsistent.

35. Ans: $\frac{100Q}{\epsilon_0}$

Sol: Charge per metre = 100Q

$\phi = \frac{1}{\epsilon_0} q = \frac{100Q}{\epsilon_0}$

36. Ans: $\frac{r}{4}$

Sol: 

$\frac{KQq}{r} = \frac{1}{2}mv^2$

$\frac{1}{2}m.\ 4v^2 = \frac{KQq}{r'}$

$4 = \frac{r}{r'} \Rightarrow r' = \frac{r}{4}$

37. Ans: π

Sol: $U = -pE\cos\theta$
For U to maximum
$\cos\theta = -1 \Rightarrow \theta = \pi$

38. Ans: $\frac{1}{3}\times10^{-9}$ N

Sol: $\frac{KQ_1}{3} = 10,\ \frac{KQ_2}{1} = 10$
$KQ_1 = 30\times10^{-2},\ KQ_2 = 10\times10^{-2}$
$\frac{KQ_1Q_2}{10^{-2}} = \frac{\left(30\times10^{-2}\right)\left(10\times10^{-2}\right)}{K\times10^{-2}}$
$F = \frac{1}{3}\times10^{-9}$ N

39. Ans: 0.5

Sol: Standard result.

40. Ans: 15.6 Ω

Sol: $R = \frac{\rho\lambda}{A}$
$R \propto \lambda^2$ for given volume
$\frac{R_1}{R_2} = \frac{{\lambda_1}^2}{{\lambda_2}^2}$
$R_2 = 15.6\ \Omega$

41. Ans: 2×10^{20}

Sol: $q = It = n\times 2e$
$n = \frac{It}{2e}$
$= 2\times10^{20}$

42. Ans: 1, 1.2 and 1.5

Sol: $V_A + V_B + V_C \propto 740$
$V_A + V_B \propto 440$
$V_B + V_C \propto 540$
Solving $V_A : V_B : V_C = 1 : 1.2 : 1.5$

43. Ans: The resistance of carbon decreases with the increase of temperature.

Sol: Knowledge based.

44. Ans: ±5%

Sol: Knowledge based

45. Ans: $\frac{e}{2m}\lambda$

Sol: $\frac{\mu}{L} = \frac{1}{2}\frac{e}{m}$

$\mu = \frac{1}{2}\frac{eL}{m} = \frac{eL}{2m}$

46. Ans: The radii of the wires

Sol: Knowledge based

47. Ans: $\sqrt{3}$ W

Sol: $W = mB\cos60 = mB\times\frac{1}{2}$
$\tau = mB\sin60 = \sqrt{3}$ W

48. Ans: $\sqrt{20}\times10^{-7}$ T

Sol: $B = \left\{\left[\frac{2P}{\left(\frac{d}{2}\right)^3}\right]^2 + \left[\frac{P}{\left(\frac{d}{2}\right)^3}\right]^2\right\}^{1/2}\times10^{-7}$
$\sqrt{\left(4^2+4\right)}\times10^{-7}$
$\sqrt{20}\times10^{-7} = 2\sqrt{5}\times10^{-7}$ T

49. Ans: $1:\sqrt{2}:1$

Sol: $R = \frac{mv}{qB} = \frac{\sqrt{2KE.m}}{qB}$
$R \propto \frac{\sqrt{m}}{q}$
$= 1:\sqrt{2}:1$

50. Ans: = 50 μV

Sol: $e = \frac{1}{2}B\lambda^2\omega$
= 50 μV

51. Ans: 70.7 V, 70.7 mA

Sol: $E_{rms} = \frac{E_0}{\sqrt{2}},\ I_{rms} = \frac{I_0}{\sqrt{2}}$
Each = 70.7

52. Ans: Eddy current

Sol: Standard result

53. Ans: $\frac{1}{2}E_0I_0\cos\phi$

Sol: Standard result

54. Ans: $\frac{k}{\omega}$

Sol: $\frac{k}{\omega} = \frac{\frac{2\pi}{\lambda}}{2\pi f} = \frac{1}{C}$

55. Ans: 8.86×10^{-12}

Sol: $U = \frac{1}{2} \times \frac{1}{2} \epsilon_0 E^2$

$= \frac{1}{4} \times 8.854 \times 10^{-12} \times (4)$

$= 8.86 \times 10^{-12}$

56. Ans: $\frac{3}{4}$

Sol: $\phi = \frac{360}{6} = 60°$

$I = I_0 \cos^2 30 = I_0 \times \frac{3}{4}$

$\frac{I}{I_0} = \frac{3}{4}$

57. Ans: 40 cm

Sol: $\frac{f_w}{f_a} = \frac{\mu - 1}{\frac{\mu_w}{\mu_a} - 1}$

$f_w = \frac{10 \times 0.5}{\frac{1}{8}} = 40$ cm

58. Ans:

Sol: $I = \frac{I_0}{2} . \frac{1}{4^4} = \frac{1}{512} I_0$

59. Ans: $\sin\theta > 8/9$

Sol: $\mu_g = \frac{9}{8}$

$\sin C = \frac{1}{{}^w\mu_g} = \frac{8}{9}$

$C = \sin^{-1}\left(\frac{8}{9}\right)$

$\theta > \sin^{-1}\frac{8}{9}$

60. Ans: 0.5 mm

Sol: Separation $= \frac{2\lambda}{b} \times d = 0.5$ mm

61. Ans: 500 km s^{-1}

Sol: $eV = \frac{1}{2} mv^2$

$v = \sqrt{2\frac{e}{m}V}$

$= \sqrt{2 \times 1.76 \times 10^{11} \times 0.71}$

$= 5 \times 10^5$ m s^{-1}

$= 500$ km s^{-1}

62. Ans: $0.4 \log_e 2$

Sol: $R = R_0 e^{-\lambda t}$

$1250 = 5000\, e^{-\lambda \times 5}$

$\lambda = 0.4\, \lambda n2$

63. Ans: $\frac{r}{4}$

Sol: $r \propto \frac{1}{p^2}$

$\frac{r'}{r} = \left(\frac{p}{2p}\right)^2 = \frac{1}{4}$

$r' = \frac{r}{4}$

64. Ans: 0.0024

Sol: $\overline{B} = \frac{2 \times 1.115}{931}$

$= 0.0024$ u

65. Ans: 0, 1, 0

Sol: x goes to zero.

Y, Z remain unchanged.

66. Ans: 240 Ω

Sol: $P = \beta^2 \frac{R_0}{R_i}$

$R_i = \frac{\beta^2 R_0}{P}$

$= 240$

67. Ans: 3.33 mA

Sol: $V_{R_2} = 10$ V, $I_{R_2} = 6.67$ mA

$I_{R_1} = \frac{5}{500} = 10$ mA

$\therefore I_Z = 10 - 6.67 = 3.33$ mA

68. Ans: Only (i) and (iii) are correct

Sol: Knowledge based.

69. Ans: 12.8 m

Sol: $h = \frac{d^2}{2R}$

$= 12.8$ m

70. Ans: 50%

Sol: $m = \frac{E_m}{E_c} = 50\%$

71. Ans: Ground wave propagation is for high frequency transmission.

Sol: Knowledge based.

72. Ans: 8 kHz

Sol: Band width $= 2xf_m$
$= 8$ k Hz

73. Ans: II < I < III < IV

Sol: $I = 16 \times 1.66 \times 10^{-24}$ g
$II = 14 \times 1.66 \times 10^{-24}$ g
$III = 32 \times 1 \times 10^{-10}$ g
$IV = 63 \times 1 \times 10^{-10}$ g

74. Ans: n = 2 to n = 1

Sol: He^+ (Z = 2) n = 4 to n = 2
H (Z = 1) $n = \frac{4}{2}$ to $n = \frac{2}{2}$

75. Ans: $O_2 > O_2^-$

Sol: B.O

$C_2 = 2$	$C_2^{2-} = 3$
$B_2^+ = 1.5$	$B_2 = 2$
$Li_2^+ = 0.5$	$Li_2 = 1$
$N_2^+ = 2.5$	$N_2 = 3$
$O_2 = 2$	$O_2^- = 1.5$

76. Ans: o–nitrophenol

Sol: Because of the proximity of the –OH and $–NO_2$ groups.

77. Ans: 0.67, 0.33

Sol: $C_2H_6 + \frac{7}{2} O_2 \rightarrow 2CO_2 + 3H_2O$
$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$
$\frac{7}{2} x + 3(1 – x) = \frac{10}{3}$
$x = \frac{2}{3}$

Mole fraction of C_2H_6 and C_2H_4 are 0.67 and 0.33

78. Ans: H_2O

Sol: H_2O is diamagnetic

79. Ans: F > N > C > Be > B

Sol: F > N > C > Be > B

80. Ans: H_2S is a reducing agent and H_2O_2 is an oxidizing agent

Sol: $H_2S + H_2O_2 \rightarrow S + 2H_2O$
–2 –1 0 –2
H_2S is oxidized and H_2O_2 is reduced.

81. Ans: (iii) only

Sol: Carbides of Al & Be give methane with water.

82. Ans: NaO_2

Sol: $2NaO_2 + 2H_2O \rightarrow 2NaOH + H_2O_2 + O_2$

83. Ans: BiH_3

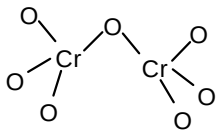
Sol: Stability of group 15 hydride decrease down the group.

84. Ans: NO_2

Sol: NO_2 dimerises on cooling to colourless N_2O_4

85. Ans: six equivalent Cr – O bonds and one Cr – O – Cr bond

Sol: $Cr_2O_7^{2-}$ has the structure



There are six equivalent Cr – O bonds and one Cr – O – Cr bond

86. Ans: (II) and (III)

Sol: Zr^{+4} & Hf^{+4} is similar in size due to lanthanide contraction
Ce^{+4} is an oxidizing agent. $La(OH)_3$ is the most basic among lanthanide hydroxides.

87. Ans: 1.0 kJ

Sol: $Q = nC\,\Delta t$
$= 2 \times 25 \times 20$ J
$= 1.0$ kJ

88. Ans: Ag_2CO_3 and AgI

Sol:

	Solubility
AgCl	10^{-5}
AgI	10^{-8}
$PbCrO_4$	2×10^{-7}
Ag_2CO_3	1.26×10^{-4}

89. Ans: $C_6H_{12}O_6$

Sol: $\Delta Tf = Kf \times m$

$$0.465 = 1.86 \times \frac{1.8}{M} \times \frac{1000}{40}$$

$M = 180$

$\therefore$ MF = $C_6H_{12}O_6$

90. Ans: 16.89

Sol: $\underset{+5}{ClO_3^-} \rightarrow \underset{0}{Cl_2}$

$$\text{Eq. mass} = \frac{84.45}{5} = 16.89$$

91. Ans: $\frac{2}{3}$

Sol: $$9 = \left(\frac{3.24 \times 10^{-2}}{1.2 \times 10^{-3}}\right)^n$$

$$9 = \left(3^3\right)^{2/3}$$

92. Ans: sodium stearate

Sol: Soaps and detergents are examples for associated colloids.

93. Ans: Have tetrahedral and square planar geometry respectively

Sol: $Ni(CO)_4$ is tetrahedral whereas $[Ni(CN)_4]^{2-}$ is square planar

94. Ans: 0.50

Sol: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

$$\frac{2}{4} \qquad \frac{2}{4} \qquad \frac{2}{4}$$

$$K_c = \frac{1}{2}$$

95. Ans: 72

Sol: $$\frac{5}{180} = \frac{2}{M}$$

$M = 72$

96. Ans: 2

Sol: $C_1\ \alpha_1^2 = C_2\ \alpha_2^2$

$0.1\ \times (10^{-2})^2 = 0.025 \times \alpha_2^2$

$\alpha_2 = 2 \times 10^{-2}$

% = 2

97. Ans: I and IV only

Sol: For a zero order reaction rate and rate constant are independent of reactant concentration.

98. Ans: $[CoF_6]^{3-}$

Sol: $[CoF_6]^{3-}$ is a high spin complex containing four unpaired electrons in it.

99. Ans: –0.28 V

Sol:

	E°	nE°
$Mn^{2+} + 2e^- \rightarrow Mn$	–1.18	–2.36 V
$Mn^{3+} + e^- \rightarrow Mn^{2+}$	1.51	1.51 V
$Mn^{3+} + 3e^- \rightarrow Mn$	–0.28	–0.85 V

100. Ans: 0.02

Sol: $$\alpha = \frac{\wedge c}{\wedge 0}$$

$$= \frac{7.8}{390} = 0.02$$

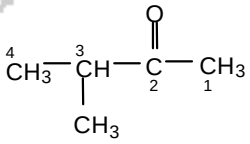
101. Ans: $[Co(NH_3)_6]Cl_3$

Sol: No. of moles of AgCl obtainable from 1 mole of the complex = $\frac{430.5}{143.5} = 3$

$\therefore$ 3 replaceable chlorines

102. Ans: 3–Methyl–2–butanone

Sol:



3-Methyl-2-butanone

103. Ans: Acetylene and benzene

Sol: HC ≡ CH and C_6H_6 have the same empirical formula and percentage composition.

104. Ans: n–pentane > 2–methylbutane > 2, 2–dimethylpropane

Sol: As branching increases among isomeric alkanes, boiling point decreases.

105. Ans: Electrolysis

Sol: It is Kolbe's electrolytic synthesis.

106. Ans: $C_6H_5 - \dot{C}H - CH_3$

Sol: It is benzylic secondary radical.

107. Ans: electromeric effect

Sol: Definition of electromeric effect.

108. Ans: Cis–2–butene and trans–2–butene

Sol: Cis–2–butene and trans–2–butene are geometrical isomers.

109. Ans: geometric, optical, position and functional isomerism

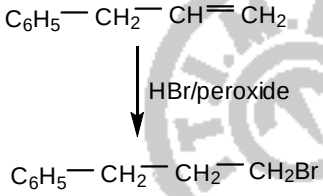
Sol: It can exhibit geometrical, optical, position and functional isomerism.

110. Ans: $CH_3Br + AgF \rightarrow$

Sol: It is Swarts reaction

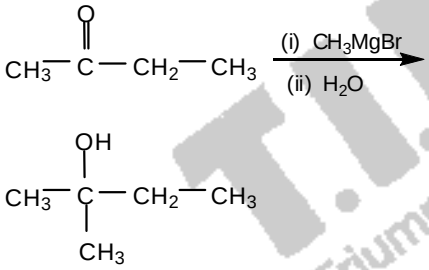
111. Ans: 1–bromo–3–phenylpropane

Sol:



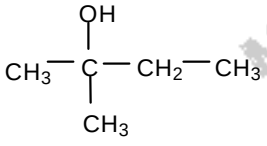
112. Ans: 2–methyl–2–butanol

Sol:



113. Ans: 2–methyl–2–butanol

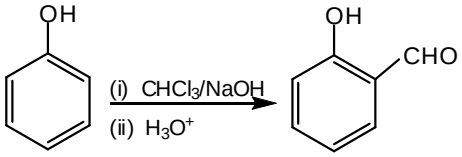
Sol:



2-Methyl-2-butanol
(3°alcohol)

114. Ans: Reimer – Tiemann reaction

Sol:

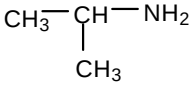


115. Ans: III < II < I

Sol: Order of boiling point is 1°> 2°> 3°

116. Ans: Isopropylamine is a secondary amine

Sol:



(1°amine)

117. Ans: glycine and amino caproic acid

Sol: glycine and amino caproic acid are the monomers used for the preparation of Nylon–2–nylon–6.

118. Ans: High density polythene

Sol: HDPE is formed by the polymerization of ethane in presence of Zeigler – Natta catalyst.

119. Ans: cetyltrimethyl ammonium bromide

Sol: cetyltrimethyl ammonium bromide is a cationic detergent used in hair conditioners.

120. Ans: Food preservatives

Sol: Salts of sorbic acid and propionic acid are used as food preservatives.