Assam CEE 2024 Question Paper

41. A piece of copper and another of germanium are cooled from room temperature to 100K. The resistance of

(A) copper decreases and germanium increases

(B) copper increases and germanium decreases

(C) each of them decreases

(D) each of them increases

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42. In the uranium radioactive series the initial nucleus is ^{238}U and the final nucleus is ^{206}Pb. When the uranium nucleus decays to lead, the number of α-particles and β-particles emitted respectively are:

(A) 4, 6

(B) 8, 6

(C) 5, 8

(D) 7, 4

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43. The ratio of specific heats $\frac{C_P}{C_V}$ in terms of degrees of freedom (n) is given by:

(A) $1 + \frac{n}{3}$

(B) $1 + \frac{2}{n}$

(C) $1 + \frac{1}{n}$

(D) $1 + \frac{n}{2}$

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44. A transverse wave is described by the equation $y = A\sin\left(2\pi\left(\frac{r}{\lambda} - \frac{t}{T}\right)\right)$. The maximum particle velocity is equal to four times the wave velocity if:

(A) $\lambda = 2A$

(B) $\lambda = \pi A$

(C) $\lambda = \frac{\pi A}{2}$

(D) $\lambda = \frac{\pi A}{4}$

45. A pulse of light of duration 50 ns is absorbed completely by a small object initially at rest. Power of the pulse is 60 mW and speed of light is 3×10^8 m/s. The final momentum of the object is:

(A) 1.0×10^{-17} kg m/s

(B) 3.0×10^{-17} kg m/s

(C) 1.0×10^{-16} kg m/s

(D) 3.0×10^{-16} kg m/s

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46. A series R-C combination is connected to an AC voltage of angular frequency $\omega = 1000$ rad/s. If the impedance of the RC circuit is $R/\sqrt{2}$, the time constant (in milliseconds) of the circuit is:

(A) 3

(B) 1

(C) $\frac{1}{2}$

(D) $\frac{1}{3}$

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47. A block of mass 300 g is kept stationary on a smooth inclined plane by applying a minimum horizontal force $F = \sqrt{a}\,N$ as shown in the figure. The value of a is (Take $g = 10\,\text{m/s}^2$):

(A) 12

(B) 24

(C) 27

(D) 9

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48. Two very long, straight, and insulated wires are kept at a 90° angle from each other in the x-y plane as shown in the figure. These wires carry equal currents of magnitude I, whose directions are shown in the figure. The net magnetic field at point P will be:

(A) $\frac{\mu I}{2\pi(x+y)}$

(B) $-\frac{\mu I}{2\pi(x+y)}$

(C) $\frac{\mu I}{\pi(x+y)}$

(D) Zero

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49. At temperature T, the probability of ideal gas molecules with mass m having speed v is given by $P(v)$. Two quantities I_1 and I_2 are defined in terms of $P(v)$ as follows:

$$I_1 = \int_0^\infty P(v)v^3 \, dv \quad \text{and} \quad I_2 = \int_0^\infty P(v)v \, dv$$

Which of the following relationship is true?

(A) $I_1 = I_2$

(B) $I_1 = \frac{I_2}{2}$

(C) $I_1 > I_2$

(D) $I_1 < I_2$

---

50. Consider a viscous fluid having uniform density ρ and coefficient of viscosity η. Two solid spheres with radius R_1 and R_2 fall into this liquid and acquire terminal velocities of V and $8V$ respectively. If the densities of the two spheres are 2ρ and 3ρ respectively, then R_1 is equal to R_2?

(A) 2

(B) $\frac{1}{2}$

(C) 8

(D) $\frac{1}{8}$

---

51. In a Doppler effect experiment, initially an observer and the source are moving towards each other with equal speeds. The observed frequency in this case is found to be f_0. The observed frequency once they cross each other is found to be f'. If f is the frequency at the source, f' is equal to:

(A) $\frac{f_0 + f}{\sqrt{f_0 f}}$

(B) $\frac{f_0 - f}{f_0}$

(C) $\frac{f_0}{f_0}$

(D) $f' = f\left(\frac{f_0}{f_0}\right)$

---

52. 1 gm of ice at $0°$C is mixed with 1 gm of water at $100°$C. At thermal equilibrium,

the temperature of the mixture will be:

(A) 50°C

(B) 20°C

(C) 10°C

(D) 100°C

---

53. Consider two radioactive materials A and B. When A decays into 6.25 percent of its original amount, B decays into 25 percent of its original amount. The ratio of their decay constants λ_A and λ_B is:

(A) 1:4

(B) 4:1

(C) 1:2

(D) 2:1

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54. The efficiency of a Carnot engine operating between a reservoir and an sink is η. If the temperature of the reservoir is increased by 50% and that of the sink is decreased by 50%, the new efficiency will be:

(A) $\frac{\eta}{2}$

(B) 4η

(C) $\frac{200\eta}{3}$

(D) $\frac{\eta}{4}$

---

55. The dimension of force constant is

(A) $[M^1 L T^{-2}]$

(B) $[M^0 L^1 T^{-2}]$

(C) $[M^1 L^1 T^{-2}]$

(D) $[M^1 L T^{-1}]$

---

56. Two bodies (A and B) of masses 7 kg and 3 kg are attached to each other in the following way. If a force of 100 N is applied on A along the x direction, the force on A on B will be

4

(A) 10 N

(B) 20 N

(C) 30 N

(D) 9.8 N

---

57. A system goes from state a to b along the path abc, when 20 kJ of heat flows into the system and the system does 7.6 kJ of work. If the system is returned back from b to a along the curved path bca due to a work of 5 kJ done on it, then

(A) 12.6 kJ of heat will be absorbed by the system

(B) 19.5 kJ of heat will be rejected by the system

(C) 7.5 kJ of heat will be absorbed by the system

(D) 17.5 kJ of heat will be rejected by the system

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58. For a straight wire carrying steady current in the vertically upward direction as shown below

(A) The magnetic field lines around the wire are directed clockwise and the magnetic field strength at A is more than that at B.

(B) The magnetic field lines around the wire are directed anti-clockwise and the magnetic field strength at A is less than that at B.

(C) The magnetic field lines around the wire are directed clockwise and the magnetic field strength at A and B are the same.

(D) The magnetic field lines around the wire are directed anti-clockwise and the magnetic field strength at A is more than that at B.

---

59. Four closed surfaces and corresponding charge distributions are shown below. The respective electric fluxes through the surfaces S_1, S_2, S_3, S_4 are $\Phi_1, \Phi_2, \Phi_3, \Phi_4$. Then, which of the following is correct?

(A) $\Phi_1 > \Phi_2 > \Phi_3 > \Phi_4$

(B) $\Phi_1 = \Phi_2 > \Phi_3 > \Phi_4$

(C) $\Phi_1 > \Phi_2 = \Phi_3 > \Phi_4$

(D) $\Phi_1 > \Phi_2 = \Phi_3 < \Phi_4$

60. A particle moves in a circle of radius R. In half the period of revolution its displacement and distance covered respectively are:

(A) $2R, \pi R$

(B) $2\pi R, 2R$

(C) $R, 2R$

(D) $\pi R, \frac{R}{2}$

61. The work function of a given metal is 4 eV. The longest wavelength of light that can cause photoelectron emission from this metal is:

(A) 220 nm

(B) 400 nm

(C) 310 nm

(D) 520 nm

62. A point object is placed at a distance of 25 cm from a thin plano-convex lens of focal length 20 cm. The plane surface of the lens is now silvered. The image created by the system is at:

(A) 100 cm to the left of the system

(B) 100 cm to the right of the system

(C) 16.7 cm to the right of the system

(D) 16.7 cm to the left of the system

63. A ray of light passes through four transparent media with refractive index n_1, n_2, n_3, n_4 as shown in the figure. The surfaces of all media are parallel. If the emergent ray ST is parallel to the incident ray PQ, we must have:

(A) $n_1 = n_2$

(B) $n_4 = n_1$

(C) $n_3 = n_4$

(D) $n_2 = n_3$

64. The temperature of an ideal gas is increased from 75 K to 300 K. If at 75 K the r.m.s. velocity of the gas molecules is v, at 300 K it becomes:

(A) $v = 2v$

(B) $v = \sqrt{2}v$

(C) $v = 4v$

(D) $v = \frac{1}{2}v$

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65. A liquid drop of radius $R = 0.1$ m having surface tension $S = \frac{0.01}{4\pi}$ N/m divides itself into n identical drops. In the process, the total change in the surface energy $\Delta U = 10^{-4}$ J. The value of n is

(A) 121

(B) 1381

(C) 8

(D) 27

---

66. If the angular momentum of a planet of mass M, moving around the sun in a circular orbit, is L. The areal velocity of the planet about the center of the sun is

(A) $\frac{L}{M}$

(B) $\frac{4L}{M}$

(C) $\frac{L}{2M}$

(D) $\frac{2L}{M}$

---

67. The torque of a force $\mathbf{F} = 4\hat{i} - 2\hat{j} + 3\hat{k}$ about the origin is r. The force acts on a particle having position vector $\hat{i} + 2\hat{j} - \hat{k}$. Then the torque r is:

(A) $4\hat{i} - \hat{j} - 10\hat{k}$

(B) $8\hat{i} - 7\hat{j} + 6\hat{k}$

(C) $4\hat{i} - 7\hat{j} - 10\hat{k}$

(D) $8\hat{i} + \hat{j} - 10\hat{k}$

---

68. A wire of length L meter carrying current i ampere is bent in the form of a circle. The magnitude of its magnetic moment in SI units is:

(A) $\frac{iL^2}{4\pi}$

(B) $\frac{iL^2}{\pi}$

(C) $\frac{iL^2}{2\pi}$

(D) $\frac{iL^2}{m}$

---

69. In the circuit below, A and B represent two inputs and C represents the output. The circuit represents:

(A) NOR gate

(B) OR gate

(C) NAND gate

(D) AND gate

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70. The current I drawn from the 5 volt source will be:

(A) 0.17 A

(B) 0.38 A

(C) 0.5 A

(D) 0.67 A

---

71. A particle is moving in a uniform circular motion of radius R with angular velocity ω in the anti-clockwise direction. Another particle is also moving along the same circular path but in the clockwise direction with the same angular velocity ω. Suppose, both the particles start at $t = 0$ from the same point (R, 0) in opposite directions. The minimum time t after which the velocities of the two particles become orthogonal to each other is:

(A) $\frac{\pi}{4\omega}$

(B) $\frac{\pi}{2\omega}$

(C) $\frac{\pi}{\omega}$

(D) $\frac{\pi}{8\omega}$

---

72. Consider a uniformly dense spherical shell of inner radius a and outer radius b. If M is the mass of the shell, the moment of inertia of the spherical shell about an axis

passing through its center is:

(A) $\frac{3Mb^2}{5}$

(B) Mb^2

(C) $\frac{M}{(b^2+a^2)}$

(D) $\frac{3Mb^5-5Mb^3}{b^3-a^3}$

---

73. Consider the following spring configurations:

If the first spring is stretched by an amount $\triangle x$, the second system will be stretched by:

(A) $\triangle x$

(B) $\frac{\triangle x}{4}$

(C) $\frac{\triangle x}{2}$

(D) $2\triangle x$

---

74. Which of the following is not a representation of uniform motion?

(A) Linear increase in distance with time

(B) Constant increase in distance with time

(C) Non-linear increase in distance with time

(D) Constant decrease in distance with time

---

75. The total displacement of the object that exhibits the following motion is

(A) 150 m

(B) 100 m

(C) 75 m

(D) 15 m

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76. The magnetic properties of magnets are

(A) Lost at its boiling point

(B) Gained at its melting point

(C) Intake at Triple point

(D) Lost at its Curie point

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77. Diffraction of light involves

(A) Dispersion

(B) Refraction

(C) Polarization

(D) Interference

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78. The densities of the nuclei: $^{24}_{12}Mg$, $^{40}_{20}Ca$ and $^{88}_{38}Sr$,

(A) Have increasing trend

(B) Have decreasing trend

(C) Remain same

(D) None of these is correct

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79. For a system executing simple harmonic motion,

(A) Displacement leads velocity and acceleration by phase of $\frac{\pi}{2}$ and π, respectively

(B) Displacement lags both velocity and acceleration by a phase of $\frac{\pi}{2}$

(C) Displacement lags velocity and acceleration by phase of $\frac{\pi}{2}$ and π, respectively

(D) Displacement, velocity and acceleration are in phase

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80. In the following circuit, the charge stored in capacitors C_1, C_2, and C_3 are

(A) 18 C, 36 C, 54 C

(B) 24 C, 48 C, 216 C

(C) 2.7 C, 1.33 C, 0.30 C

(D) 12 C, 24 C, 36 C

---

81. The molar conductance of KCl, HCl and CH_3COOK are 152, 425 and 91 cm^2 ohm^{-1} respectively. Here, the molar conductance of CH_3COOH at infinite dilution would be.

(A) 346 cm^2 ohm^{-1}

(B) 364 cm^2 ohm^{-1}

(C) 389 cm^2 ohm^{-1}

(D) 486 cm^2 ohm^{-1}

82. In K[Cr(H$_2$O)$_6$](C$_2$O$_4$)$_2$] .3H$_2$O, the spin only magnetic moment of Cr^3 ion is

(A) 2.87 B.M.

(B) 3.87 B.M.

(C) 3.47 B.M.

(D) 4.89 B.M.

83. The CORRECT order of ionic radii of the following lanthanides is:

(A) Eu^{3+} > Ce^{3+} > Tb^{3+}

(B) Ce^{3+} > Eu^{3+} > Tb^{3+}

(C) Eu^{3+} = Ce^{3+} > Tb^{3+}

(D) Eu^{3+} > Ce^{3+} > Tb^{3+}

84. Among the following, the compound with highest melting point is:

(A) Benzene with one chlorine atom attached

(B) Benzene with two chlorine atoms attached

(C) Benzene with three chlorine atoms attached

(D) Benzene with chlorine atoms attached in a particular arrangement

85. The most effective reaction for the synthesis of 1-methoxy-4-nitrobenzene is:

(A) 1-Bromo-4-nitrobenzene reacting with sodium methoxide

(B) 1-Bromo-4-nitrobenzene reacting with sodium chloride

(C) 1-Bromo-4-nitrobenzene reacting with sodium methoxide and chlorine
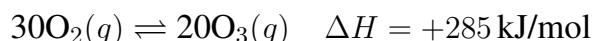
(D) Reaction leading to a different product

86. Among the following, the molecule which shows aromatic character is:

(A) Benzene (C$_6$H$_6$)

(B) Cyclohexene

(C) Cycloheptatriene

(D) Cyclooctatetraene

87. Identify the essential amino acid among the following:

(A) $HS\,C\,C\,COOH$

(B) $HO\,C\,C\,CO_2H$

(C) $H_2NOC\,C\,CO_2H$

(D) $C_6H_5\,C\,CO_2H$

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88. For the following reaction at 298 K:

$$3O_2(g) \rightleftharpoons 2O_3(g) \quad \Delta H = +285\,\text{kJ/mol}$$

The equilibrium constant, K_c, is

$K_c = 2.47 \times 10^{-31}$ at 298 K. The value of K_c will increase when 298 K is increased.

(A) Temperature is increased and pressure is decreased.

(B) Temperature is decreased and pressure is increased.

(C) Temperature is decreased and pressure is decreased.

(D) Temperature and pressure both are increased.

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89. O_2 molecule has:

(A) 10 bonding electrons, 6 antibonding electrons and is diamagnetic.

(B) 8 bonding electrons, 4 antibonding electrons and is paramagnetic.

(C) 10 bonding electrons, 6 antibonding electrons and is paramagnetic.

(D) 8 bonding electrons, 4 antibonding electrons and is diamagnetic.

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90. According to Bohr's theory, when principal quantum number is 2, the radius of Be^{3+} will be:

(A) 52.90 pm

(B) 26.45 pm

(C) 105.80 pm

(D) 13.23 pm

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91. A solid forms fcc unit cell with $2A$ side length. If another solid with exactly same

atomic radius (r) as that of the above solid forms a simple cubic lattice, the side length of the unit cell will be:

(A) $\sqrt{2}\,A$

(B) $2\,A$

(C) $\frac{2}{\sqrt{2}}\,A$

(D) $\frac{1}{\sqrt{2}}\,A$

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92. For the reaction, $A + B \rightarrow$ products, the following data is obtained:

A + B $\rightarrow$ products, the following data is given:

Exp. No.	$[A]\,(\text{mol L}^{-1})$	$[B]\,(\text{mol L}^{-1})$	Initial rate $(\text{mol L}^{-1}s^{-1})$
1	0.2	0.4	0.8
2	0.4	0.2	1.6
3	0.3	0.2	0.4

The rate law of the reaction is:

(A) $k[A][B]$

(B) $k[A]$

(C) $k[B]^2$

(D) $k[A]^1[B]^2$

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93. 2 moles of a solute is dissolved in 1 kg water (K_b = 0.52 K kg

mol^{-1}). $The\ solute\ dissociates\ to\ give\ 3\ moles\ of\ particles\ in\ solution.\ The\ elevation\ of\ boiling\ point\ will\ be:$

(A) 3.18 K

(B) 1.04 K

(C) 1.56 K

(D) 2.08 K

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94. The boiling point and melting point of a pure solvent are 353.3 K and 278.6 K, respectively. A solute is dissolved in the solvent to get a solution. Which one of the following can be true?

(A) The boiling point and melting point of the solution are 352.42 K and 279.2 K, respectively.

(B) The boiling point and melting point of the solution are 352.42 K and 279.9 K, respectively.

(C) The boiling point and melting point of the solution are 354.11 K and 279.2 K, respectively.

(D) The boiling point and melting point of the solution are 352.42 K and 276.83 K, respectively.

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95. The main product formed in the following reaction is:

$$CH_3 - CH_2 - CH = CH_2 + HBr \longrightarrow$$
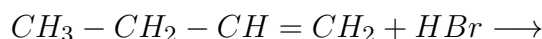
(A) 1-Bromobutane

(B) 2-Bromobutane

(C) 1-Bromo-2-methyl propane

(D) 2-Bromo-2-methyl propane

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96. The hydrophilic part of $CH_3(CH_2)_{16}COO^-Na^+$ is:

(A) COO^-

(B) $CH_3(CH_2)_{16}^-$

(C) Na^+

(D) CH_3^-

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98. The pH value of 0.005 M Ba(OH)$_2$, $assume Ba(OH)_2 is completely ionized, is$:

(A) 5

(B) 3

(C) 10

(D) 12

---

99. The wavelength of an electron moving with a velocity of 2.2×10^7 ms^{-1} is:

(A) 3.5×10^{-10} m

(B) 3.5×10^{-11} m

(C) 3.3×10^{-10} m

(D) 3.3×10^{-11} m

---

100. The INCORRECT combination of quantum numbers amongst the following is:

(A) $n = 1,\ l = 0,\ m_l = 0,\ m_s = -\frac{1}{2}$

(B) $n = 1,\ l = 1,\ m_l = 0,\ m_s = +\frac{1}{2}$

(C) $n = 2,\ l = 1,\ m_l = +1,\ m_s = -\frac{1}{2}$

(D) $n = 3,\ l = 1,\ m_l = 0,\ m_s = +\frac{1}{2}$

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101. For a first order reaction with rate constant of 230 s^{-1}, the half-life is:

(A) 3.45×10^{-2} s

(B) 3.01×10^{-2} s

(C) 3.45×10^{-3} s

(D) 3.01×10^{-3} s

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102. For the compounds given below, the CORRECT order of increasing oxidation number of I is:

(A) $ICl < HI < HIO_3$

(B) $HI < ICl < HIO_2 < KIO_3$

(C) $HIO_2 < ICl < HI < KIO_3$

(D) $KIO_3 < HIO_2 < ICl < HI$

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103. Identify the strongest base among the following amines:

(A) $C_6H_5NH_2$

(B) $C_2H_5NH_2$

(C) $C_6H_5NH_2$

(D) $C_6H_5NH_2$

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104. The reducing agent X suitable for the following reduction reaction is:

(A) $LiAlH_4$

(B) B_2H_6

(C) $NaBH_4$

(D) CaO

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105. Which of the following compounds is most acidic?

(A) C_6H_5OH

(B) $o - O_2N - C_6H_4OH$

(C) $m - O_2N - C_6H_4OH$

(D) $p - O_2N - C_6H_4OH$

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106. Identify the major products 'A' and 'B' for the following reactions:

(A) A: $CH_2 = CH_2$, B: CH_3CH_2OH

(B) A: $CH_2 = CH_2$, B: $CH_3CH_2OCH_3$

(C) A: CH_3CH_2, B: $CH_3CH_2OCH_3$

(D) A: $CH_3CH_2CH_2$, B: CH_3CH_2O

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107. During a process the enthalpy change of the system, ΔH is positive and entropy change of the system, ΔS is negative. The process will be:

(A) spontaneous at all temperatures

(B) spontaneous when ΔH is negative and ΔS is positive

(C) spontaneous when ΔH is positive and ΔS is negative

(D) non-spontaneous at all temperatures

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108. In an irreversible isothermal expansion of 2 moles of an ideal gas, work done (W) is found to be (-P_{ext}V). If the same isothermal expansion is carried out reversibly, the work done will be:

(A) -0.683 RT

(B) -1.386 RT

(C) -0.3010 RT

(D) 0

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109. Which one of the following has a non-zero resultant dipole moment?

(A) BeF_2

(B) NF_3

(C) BF_3

(D) CO_2

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110. Which one of the following is the most acidic?

(A) Na_2O

(B) Al_2O_3

(C) CaO

(D) Cl_2O_7

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111. The second ionisation enthalpy is the highest for
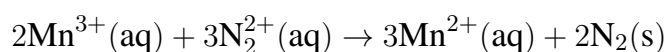
(A) F

(B) Ne

(C) Na

(D) Mg

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112. The CORRECT electronic configuration of Cr is

(A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$

(B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$

(C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$

(D) $1s^2 2s^2 2p^6 3s^2 3p^3 3d^{10}$

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113. For a multielectron atom, the CORRECT order of the orbital energy is

(A) $6s > 5p > 4s > 3d$

(B) $5p > 6s > 4f > 4s$

(C) $6s > 5p > 4f > 4s$

(D) $4f > 6s > 5p > 4s$

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114. For the following reaction

$$2\text{Mn}^{3+}(\text{aq}) + 3\text{N}_2^{2+}(\text{aq}) \rightarrow 3\text{Mn}^{2+}(\text{aq}) + 2\text{N}_2(\text{s})$$

The standard Gibbs free energy change (ΔG°) of the reaction is

(A) $-6\,\text{F}$

(B) $-12\,\text{F}$

(C) $-3\,\text{F}$

(D) $-9\,\text{F}$

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115. The standard electrode potential of electrode-A and electrode-B are $-0.25\,\text{V}$ and $-0.76\,\text{V}$, respectively. If a Galvanic cell is created using these two electrodes, the standard electromotive force (EMF) of this cell will be:

(A) 0.51 V and electrode-B will act as anode

(B) 0.51 V and electrode-A will act as anode

(C) 0.51 V and electrode-B will act as anode

(D) 1.01 V and electrode-B will act as anode

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116. The state of hybridization of carbon and shape of the formaldehyde molecule, respectively are:

(A) sp^2, Trigonal planar

(B) sp^2, Tetrahedral

(C) sp^3, Trigonal planar

(D) sp^3, Tetrahedral

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117. The IUPAC name of the following compound is:

(A) 1-Ethyl-4-Fluoro-3-nitro benzene

(B) 1-Ethyl-2-Fluoro-1-nitro benzene

(C) 3-Ethyl-6-Fluoro-1-nitro benzene

(D) 4-Ethyl-1-Fluoro-2-nitro benzene

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118. An aqueous solution of a dibasic acid (MW = 118) containing 35.4 g of the acid per liter of the solution, has density 1.00 g/cm^3. The normality and molality values of the solution respectively will be:

(A) 0.6 N, 0.3 mol Kg^{-1}

(B) 0.3 N, 0.3 mol Kg^{-1}

(C) 0.3 N, 0.6 mol Kg^{-1}

(D) 0.6 N, 0.6 mol Kg^{-1}

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119. Which one of the following compounds is the most reactive in $S_N 1$ reaction?

(A) C_6H_5-CH_2Br

(B) C_6H_5-CH_2Br

(C) C_6H_5-CH_2Br

(D) C_6H_5-CH_2-C_6H_5

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120. Lactose is a disaccharide present in milk. It comprises of

(A) $\beta - D$-Galactose and $\beta - D$-Glucose

(B) $\alpha - D$-Galactose and $\beta - D$-Glucose

(C) $\beta - D$-Glucose and $\beta - D$-Fructose

(D) $\beta - D$-Glucose and $\alpha - D$-Glucose