Q. 1 – Q. 5 carry one mark each.

Q.1   The chairman requested the aggrieved shareholders to _____ him.

(A) bare with   (B) bore with   (C) bear with   (D) bare

Q.2   Identify the correct spelling out of the given options:

(A) Managable   (B) Manageable   (C) Mangaeble   (D) Managible

Q.3   Pick the odd one out in the following:

13, 23, 33, 43, 53

(A) 23   (B) 33   (C) 43   (D) 53

Q.4   R2D2 is a robot. R2D2 can repair aeroplanes. No other robot can repair aeroplanes.

Which of the following can be logically inferred from the above statements?

(A) R2D2 is a robot which can only repair aeroplanes.

(B) R2D2 is the only robot which can repair aeroplanes.

(C) R2D2 is a robot which can repair only aeroplanes.

(D) Only R2D2 is a robot.

Q.5   If $|9y-6| = 3$, then $y^2 - 4y/3$ is _____.

(A) 0   (B) +1/3   (C) −1/3   (D) undefined

Q. 6 – Q. 10 carry two marks each.

Q.6 The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is ____.
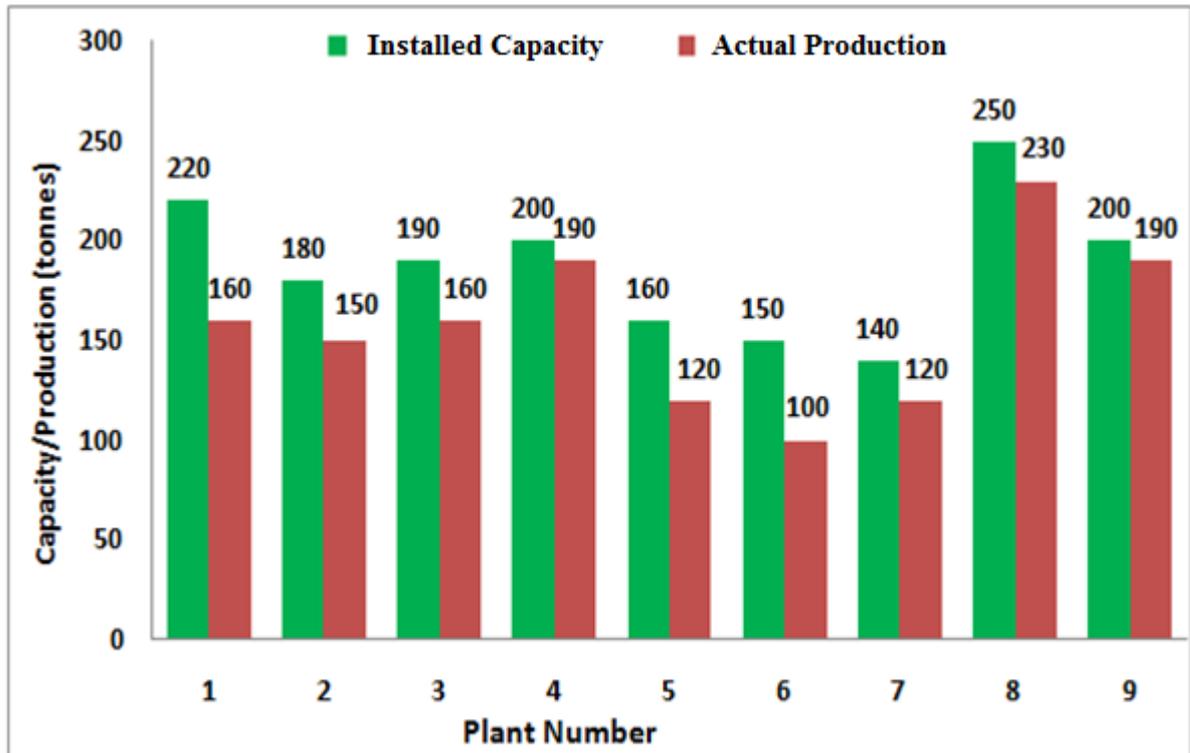
Q.7 A poll of students appearing for masters in engineering indicated that 60 % of the students believed that mechanical engineering is a profession unsuitable for women. A research study on women with masters or higher degrees in mechanical engineering found that 99 % of such women were successful in their professions.

Which of the following can be logically inferred from the above paragraph?

(A) Many students have misconceptions regarding various engineering disciplines.

(B) Men with advanced degrees in mechanical engineering believe women are well suited to be mechanical engineers.

(C) Mechanical engineering is a profession well suited for women with masters or higher degrees in mechanical engineering.

(D) The number of women pursuing higher degrees in mechanical engineering is small.

Q.8   Sourya committee had proposed the establishment of Sourya Institutes of Technology (SITs) in line with Indian Institutes of Technology (IITs) to cater to the technological and industrial needs of a developing country.

Which of the following can be logically inferred from the above sentence?

Based on the proposal,
  (i)   In the initial years, SIT students will get degrees from IIT.
  (ii)   SITs will have a distinct national objective.
  (iii)   SIT like institutions can only be established in consultation with IIT.
  (iv)   SITs will serve technological needs of a developing country.

(A) (iii) and (iv) only.   (B) (i) and (iv) only.

(C) (ii) and (iv) only.   (D) (ii) and (iii) only.

Q.9   Shaquille O' Neal is a 60% career free throw shooter, meaning that he successfully makes 60 free throws out of 100 attempts on average. What is the probability that he will successfully make exactly 6 free throws in 10 attempts?

(A) 0.2508   (B) 0.2816   (C) 0.2934   (D) 0.6000

Q.10   The numeral in the units position of $211^{870} + 146^{127} \times 3^{424}$ is _____.

END OF THE QUESTION PAPER

H : CHEMISTRY (COMPULSORY)

Q. 1 – Q. 5 carry one mark each.

Q.1   The species having shortest B–F bond distance is

(A) BF_3 (B) $[BF_4]^-$ (C) $H_3N \cdot BF_3$ (D) $(CH_3)_2O \cdot BF_3$

Q.2   The total number of chair conformations possible for 1,2-dimethylcyclohexane is _____.

Q.3   'A harmful substance persists in the environment for a very long period of time'. The UNACCEPTABLE statement for this fact is

(A) the substance degrades by second-order kinetics
(B) the substance degrades by first-order kinetics
(C) the substance is not biodegradable
(D) the substance has long half-life

Q.4   For an enzyme catalyzed reaction, the plot that correctly represents the relationship between the rate and temperature is

(A)

(B)

(C)

(D)
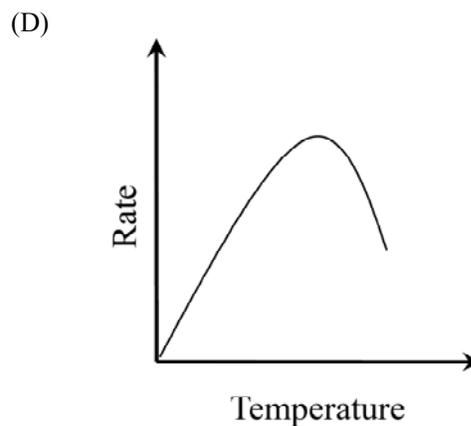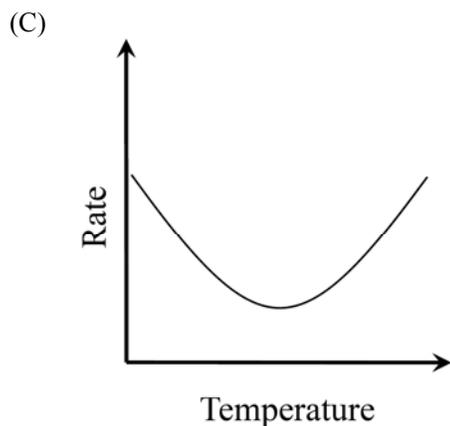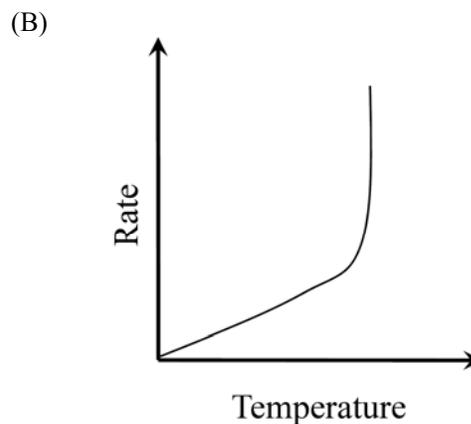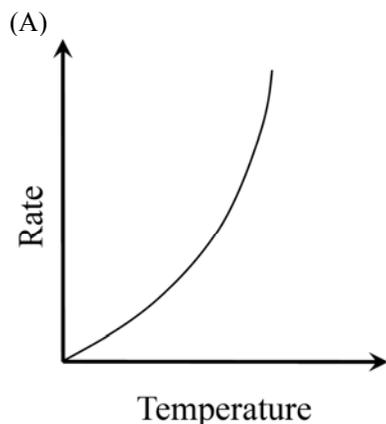
Q.5   Combinations of a process and equation are given below. The INCORRECT combination is

(A) Constant pressure heating with no phase change; $w = -\int_1^2 P \, dV$

(B) Reversible adiabatic process in a perfect gas; $\Delta U = \int_1^2 C_p(T) dT$

(C) Reversible isothermal process in a perfect gas; $w_{rev} = -\int_1^2 P \, dV$

(D) Constant volume heating with no phase change; $\Delta U = \int_1^2 C_v dT$

Q. 6 – Q. 15 carry two marks each.

Q.6   The correct comparison of pK_a's of $[Fe(H_2O)_6]^{2+}$, $[Fe(H_2O)_6]^{3+}$, V_2O_5 and N_2O_5 is

(A) $[Fe(H_2O)_6]^{3+} < [Fe(H_2O)_6]^{2+}$ and $V_2O_5 < N_2O_5$
(B) $[Fe(H_2O)_6]^{3+} < [Fe(H_2O)_6]^{2+}$ and $V_2O_5 = N_2O_5$
(C) $[Fe(H_2O)_6]^{2+} = [Fe(H_2O)_6]^{3+}$ and $N_2O_5 < V_2O_5$
(D) $[Fe(H_2O)_6]^{3+} < [Fe(H_2O)_6]^{2+}$ and $N_2O_5 < V_2O_5$

Q.7   **Given**: The potential energy of two electrons separated by Bohr radius is 27.211 eV. The first Bohr radius of hydrogen is 0.5292 Å. The electron makes an orbit of radius 0.5295Å around the nucleus in hydrogen.
The calculated ionization energy (eV) of hydrogen atom is _____.

Q.8   The crystal field stabilization energy (excluding pairing energy, if any) of $[CoCl_4]^{2-}$ in Δ_o units is _____.

Q.9   The correct statement is

(A) $TlBr_3$ is less soluble in water than $TlBr$
(B) Ag_2S is more soluble in water than Ag_2O
(C) LiF is less stable than CsF
(D) $[Co(NH_3)_5I]^{2+}$ is less stable than $[Co(NH_3)_5F]^{2+}$

Q.10   Ferrous sulfate on reaction with potassium hexacyanochromate(III) produces a brick red complex. The number of unpaired electrons on Fe in the red complex is _____.

Q.11   The major product formed in the following reaction is (ignore product stereochemistry)

(A)   (B)

(C)   (D)
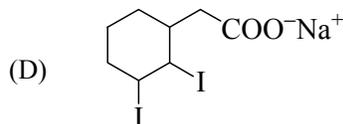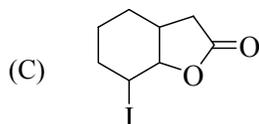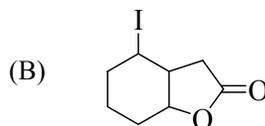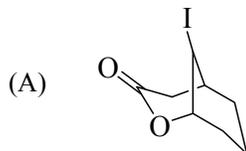
Q.12   When 1.0 g of urea (Molecular Weight = 60) is dissolved in 200 g of solvent **S**, the freezing point of **S** is lowered by 0.25 °C. When 1.5 g of a non-electrolyte **Y** is dissolved in 125 g of **S**, the freezing point of **S** is lowered by 0.20 °C. The molecular weight of **Y** is _____.

Q.13   The major product formed in the following reaction is

(A)   (B)

(C)   (D)
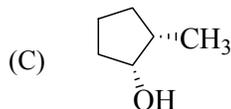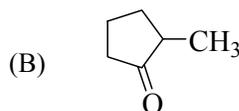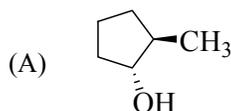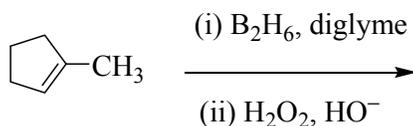
Q.14   For a weak acid at 298 K the molar conductivities (in ohm^{-1} m^2 mol^{-1}), at infinite dilution and 0.04 mol dm^{-3} are 4.3×10^{-3} and 1.0×10^{-3}, respectively. The degree of dissociation of the acid (0.04 mol dm^{-3}) at 298 K is _____.

Q.15   For propene at 298 K, the molar enthalpy of hydrogenation is –124.27 kJ mol^{-1} and the standard enthalpy of formation is 20.42 kJ mol^{-1}. For propane at 298 K, the standard enthalpy of formation in kJ mol^{-1} is_____.

END OF THE QUESTION PAPER