

Q. 1 – Q. 5 carry one mark each.

Q.1 “Going by the _____ that many hands make light work, the school _____ involved all the students in the task.”

The words that best fill the blanks in the above sentence are

- (A) principle, principal (B) principal, principle
(C) principle, principle (D) principal, principal

Ans. A

Q.2 “Her _____ should not be confused with miserliness; she is ever willing to assist those in need.”

The word that best fills the blank in the above sentence is

- (A) cleanliness (B) punctuality (C) frugality (D) greatness

Ans. C

Q.3 Seven machines take 7 minutes to make 7 identical toys. At the same rate, how many minutes would it take for 100 machines to make 100 toys?

- (A) 1 (B) 7 (C) 100 (D) 700

Ans. B

Q.4 A rectangle becomes a square when its length and breadth are reduced by 10 m and 5 m, respectively. During this process, the rectangle loses 650 m² of area. What is the area of the original rectangle in square meters?

- (A) 1125 (B) 2250 (C) 2924 (D) 4500

Ans. B

Q.5 A number consists of two digits. The sum of the digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number?

- (A) 63 (B) 72 (C) 81 (D) 90

Ans. B

Q. 6 – Q. 10 carry two marks each.

Q.6 For integers a , b and c , what would be the minimum and maximum values respectively of $a + b + c$ if $\log |a| + \log |b| + \log |c| = 0$?

- (A) -3 and 3 (B) -1 and 1 (C) -1 and 3 (D) 1 and 3

Ans. A

Q.7 Given that a and b are integers and $a + a^2 b^3$ is odd, which one of the following statements is correct?

- (A) a and b are both odd
- (B) a and b are both even
- (C) a is even and b is odd
- (D) a is odd and b is even

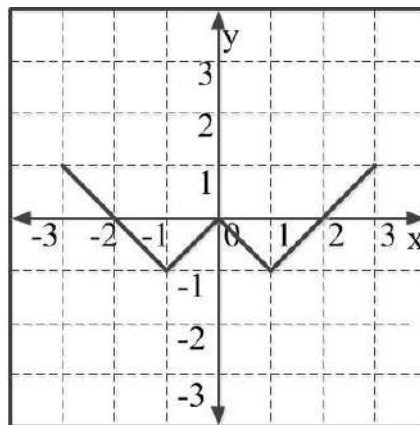
Ans. D

Q.8 From the time the front of a train enters a platform, it takes 25 seconds for the back of the train to leave the platform, while travelling at a constant speed of 54 km/h. At the same speed, it takes 14 seconds to pass a man running at 9 km/h in the same direction as the train. What is the length of the train and that of the platform in meters, respectively?

- (A) 210 and 140
- (B) 162.5 and 187.5
- (C) 245 and 130
- (D) 175 and 200

Ans. D

Q.9 Which of the following functions describe the graph shown in the below figure?



- (A) $y = ||x| + 1| - 2$
- (B) $y = ||x| - 1| - 1$
- (C) $y = ||x| + 1| - 1$
- (D) $y = ||x - 1| - 1|$

Ans. B

Q.10 Consider the following three statements:

- (i) Some roses are red.
- (ii) All red flowers fade quickly.
- (iii) Some roses fade quickly.

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

- (A) If (i) is true and (ii) is false, then (iii) is false.
- (B) If (i) is true and (ii) is false, then (iii) is true.
- (C) If (i) and (ii) are true, then (iii) is true.
- (D) If (i) and (ii) are false, then (iii) is false.

Ans. C

END OF THE QUESTION PAPER

XL-P: Q. 1 – Q. 5 carry one mark each & Q. 6 – Q. 15 carry two marks each

Q.1 For the complete combustion of graphite and diamond in oxygen individually, the standard enthalpy change (ΔH°_{298}) values are $-393.5 \text{ kJ mol}^{-1}$ and $-395.4 \text{ kJ mol}^{-1}$, respectively. Then, the ΔH°_{298} for the conversion of graphite into diamond is

- (A) $+1.9 \text{ kJ mol}^{-1}$ (B) -1.9 kJ mol^{-1} (C) $+3.8 \text{ kJ mol}^{-1}$ (D) -3.8 kJ mol^{-1}

Ans. A

Q.2 For a 4s orbital of hydrogen atom, the magnetic quantum number (m_l) is

- (A) 4 (B) 3 (C) 1 (D) 0

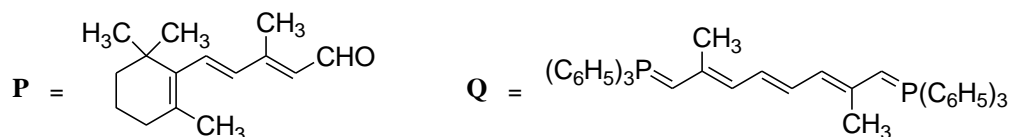
Ans. D

Q.3 Hybridization of xenon in XeF_2 is

- (A) sp (B) sp^2 (C) sp^3 (D) sp^3d

Ans. D

Q.4 Two equivalents of **P** react with one equivalent of **Q** to produce a major product **R**.



The number of double bonds present in the major product **R** is _____.

Ans. 11 to 11

Q.5 The total number of possible stereoisomers for the compound with the structural formula $\text{CH}_3\text{CH}(\text{OH})\text{CH}=\text{CHCH}_2\text{CH}_3$ is _____.

Ans. 4 to 4

Q.6 Among B–H, C–H, N–H and Si–H bonds in BH_3 , CH_4 , NH_3 and SiH_4 , respectively, the polarity of the bond which is shown **INCORRECTLY** is

- (A) $\text{B}^{\delta+}-\text{H}^{\delta-}$ (B) $\text{C}^{\delta-}-\text{H}^{\delta+}$ (C) $\text{N}^{\delta-}-\text{H}^{\delta+}$ (D) $\text{Si}^{\delta-}-\text{H}^{\delta+}$

Ans. D

Q.7 Among the following statements,

- (i) $[\text{NiCl}_4]^{2-}$ (atomic number of Ni = 28) is diamagnetic
 (ii) Ethylamine is a weaker Lewis base compared to pyridine
 (iii) $[\text{NiCl}_2\{\text{P}(\text{C}_6\text{H}_5)_3\}_2]$ has two geometrical isomers
 (iv) Bond angle in H_2O is greater than that in H_2S ,

the **CORRECT** one is

- (A) (i) (B) (ii) (C) (iii) (D) (iv)

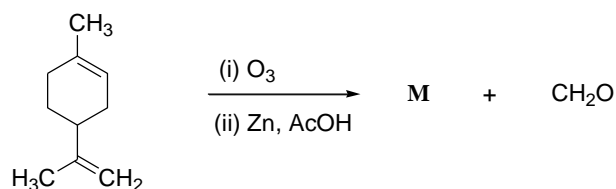
Ans. D

Q.8 In $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ (atomic number of Mn = 25), the d-d transitions according to crystal field theory (CFT) are

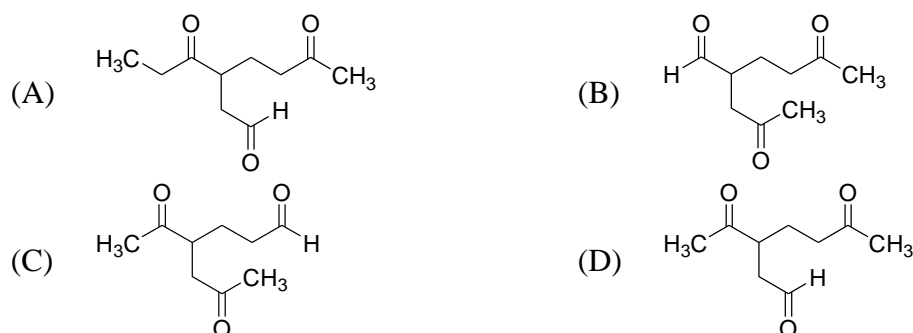
- (A) Laporte forbidden and spin forbidden
- (B) Laporte allowed and spin allowed
- (C) Laporte forbidden and spin allowed
- (D) Laporte allowed and spin forbidden

Ans. A

Q.9 The major product **M** in the reaction

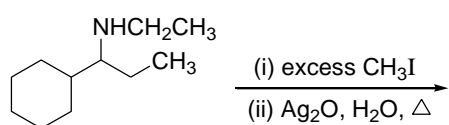


is

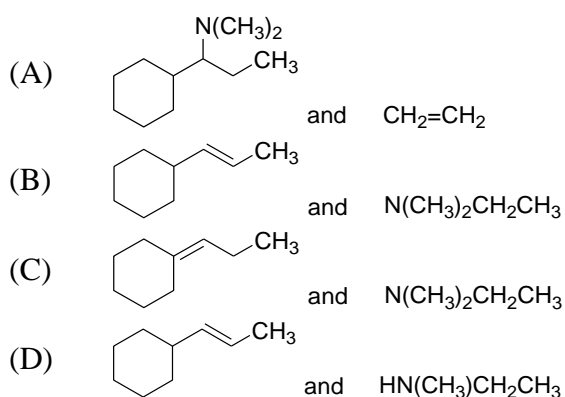


Ans. D

Q.10 The two major products of the reaction

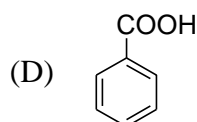
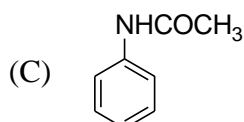
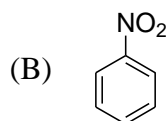
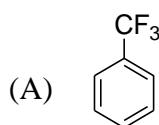


are



Ans. A

- Q.11 The compound, which upon mono-nitration using a mixture of HNO_3 and H_2SO_4 , does **NOT** give the *meta*-isomer as the major product, is



Ans. C

- Q.12 The standard reduction potential (E°) for the conversion of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+} at 25°C in an aqueous solution of pH 3.0 is 1.33 V. The concentrations of $\text{Cr}_2\text{O}_7^{2-}$ and Cr^{3+} are 1.0×10^{-4} M and 1.0×10^{-3} M, respectively. Then the potential of this half-cell reaction is (**Given:** Faraday constant = 96500 C mol^{-1} , Gas constant $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

- (A) 1.04 V (B) 0.94 V (C) 0.84 V (D) 0.74 V

Ans. B

- Q.13 The solubility product (K_{sp}) of $\text{Mg}(\text{OH})_2$ at 25°C is 5.6×10^{-11} . Its solubility in water is $\text{S} \times 10^{-2}$ g/L, where the value of **S** is _____ (up to two decimal places). (**Given:** Molecular weight of $\text{Mg}(\text{OH})_2 = 58.3 \text{ g mol}^{-1}$)

Ans. 1.39 to 1.43

- Q.14 The activation energy (E_a) values for two reactions carried out at 25°C differ by 5.0 kJ mol^{-1} . If the pre-exponential factors (A_1 and A_2) for these two reactions are of the same magnitude, the ratio of rate constants (k_1/k_2) is _____ (up to two decimal places). (**Given:** Gas constant $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

Ans. 7.39 to 7.54

- Q.15 One mole of helium gas in an isolated system undergoes a reversible isothermal expansion at 25°C from an initial volume of 2.0 liters to a final volume of 10.0 liters. The change in entropy (ΔS) of the surroundings is _____ J K^{-1} (up to two decimal places). (**Given:** Gas constant $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

Ans. -13.40 to -13.36

END OF THE QUESTION PAPER