

**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

- 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

- 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

- 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  $650 \text{ m}^2$  of area. What is the area of the original rectangle in square meters?

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

- 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

**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

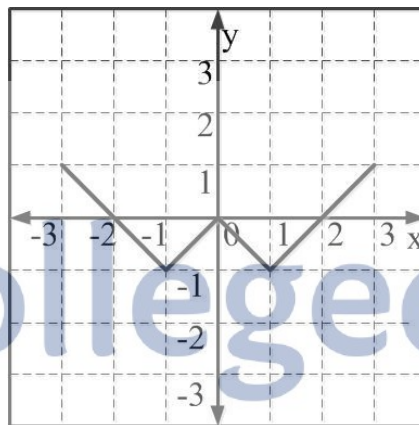
Q.7 Given that  $a$  and  $b$  are integers and  $a + a^2 b^3$  is odd, which one of the following statements is correct?

- (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

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

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)  $y = ||x - 1| - 1|$

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.

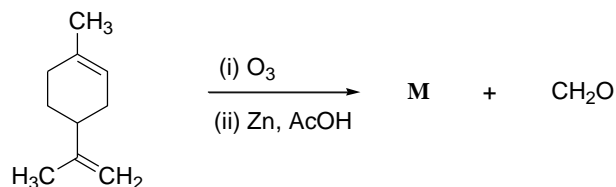
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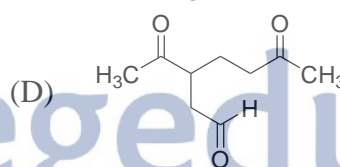
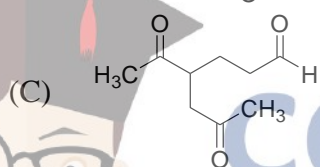
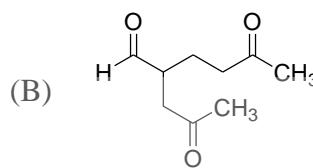
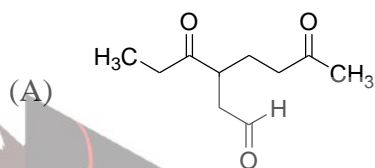
Q.8 In  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  (atomic number of Mn = 25), the d-d transitions according to crystal field theory (CFT) are

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

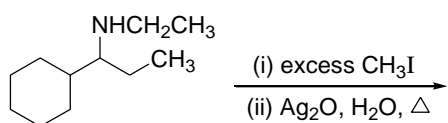
Q.9 The major product **M** in the reaction



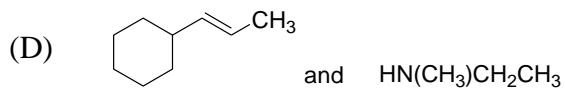
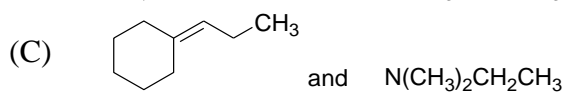
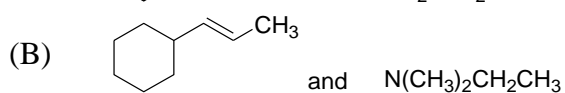
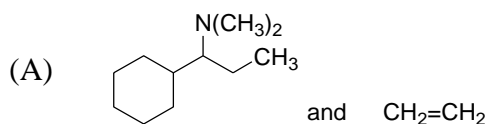
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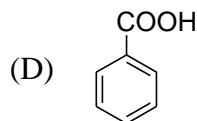
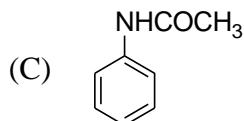
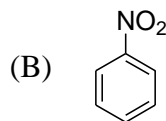
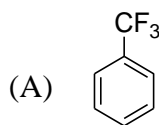
Q.10 The two major products of the reaction



are



Q.11 The compound, which upon mono-nitration using a mixture of  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$ , does **NOT** give the *meta*-isomer as the major product, is



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

Q.13 The solubility product ( $K_{\text{sp}}$ ) of  $\text{Mg}(\text{OH})_2$  at  $25^\circ\text{C}$  is  $5.6 \times 10^{-11}$ . Its solubility in water is  $S \times 10^{-2}$  g/L, where the value of  $S$  is \_\_\_\_\_ (up to two decimal places).

(Given: Molecular weight of  $\text{Mg}(\text{OH})_2 = 58.3 \text{ g mol}^{-1}$ )

Q.14 The activation energy ( $E_a$ ) values for two reactions carried out at  $25^\circ\text{C}$  differ by  $5.0 \text{ kJ mol}^{-1}$ . 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  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )

Q.15 One mole of helium gas in an isolated system undergoes a reversible isothermal expansion at  $25^\circ\text{C}$  from an initial volume of 2.0 liters to a final volume of 10.0 liters. The change in entropy ( $\Delta S$ ) of the surroundings is \_\_\_\_\_  $\text{J K}^{-1}$  (up to two decimal places).

(Given: Gas constant  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )

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