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 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

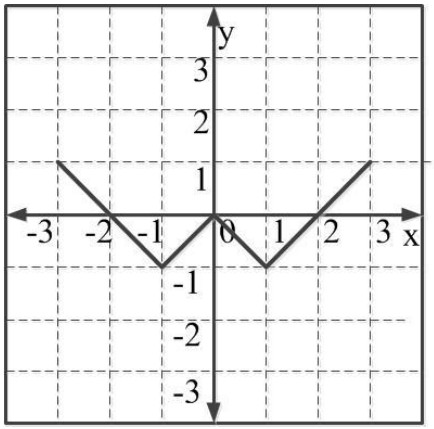
Q.7 Given that a and b are integers and $a + a^2\, b^3$ is odd, which one of the following statements is correct?

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

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.

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^o_{298}) values are –393.5 kJ mol^{-1} and –395.4 kJ mol^{-1}, respectively. Then, the ΔH^o_{298} for the conversion of graphite into diamond is

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

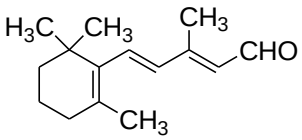
Q.2 For a 4*s* orbital of hydrogen atom, the magnetic quantum number (m_l) is

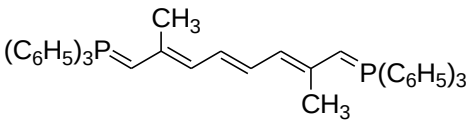
(A) 4 (B) 3 (C) 1 (D) 0

Q.3 Hybridization of xenon in XeF_2 is

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

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

P = 

Q = 

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

Q.5 The total number of possible stereoisomers for the compound with the structural formula $CH_3CH(OH)CH{=}CHCH_2CH_3$ is _____.

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

Q.7 Among the following statements,

(i) $[NiCl_4]^{2-}$ (atomic number of Ni = 28) is diamagnetic
(ii) Ethylamine is a weaker Lewis base compared to pyridine
(iii) $[NiCl_2\{P(C_6H_5)_3\}_2]$ has two geometrical isomers
(iv) Bond angle in H_2O is greater than that in H_2S,

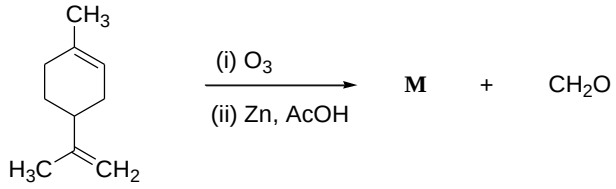
the **CORRECT** one is

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

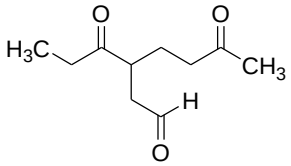
Q.8 In $[Mn(H_2O)_6]^{2+}$ (atomic number of Mn = 25), the d-d transitions according to crystal field theory (CFT) are

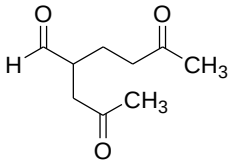
(A) Laporte forbidden and spin forbidden
(B) Laporte allowed and spin allowed
(C) Laporte forbidden and spin allowed
(D) Laporte allowed and spin forbidden

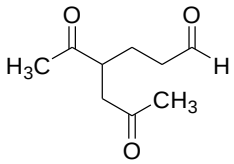
Q.9 The major product **M** in the reaction

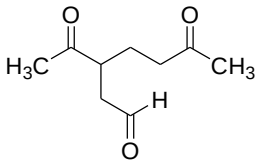


is

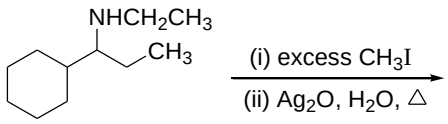
(A) 

(B) 

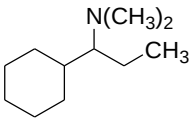
(C) 

(D) 

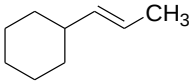
Q.10 The two major products of the reaction



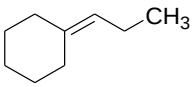
are

(A) 

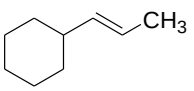
and $CH_2=CH_2$

(B) 

and $N(CH_3)_2CH_2CH_3$

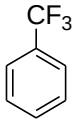
(C) 

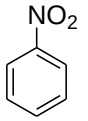
and $N(CH_3)_2CH_2CH_3$

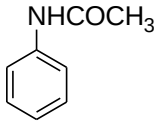
(D) 

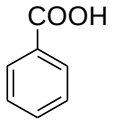
and $HN(CH_3)CH_2CH_3$

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

(A) 

(B) 

(C) 

(D) 

Q.12 The standard reduction potential (E^o) for the conversion of $Cr_2O_7^{2-}$ to Cr^{3+} at 25 °C in an aqueous solution of pH 3.0 is 1.33 V. The concentrations of $Cr_2O_7^{2-}$ 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 J K^{-1} mol^{-1})

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

Q.13 The solubility product (K_{sp}) of $Mg(OH)_2$ at 25 °C is 5.6×10^{-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 $Mg(OH)_2$ = 58.3 g mol^{-1})

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 J K^{-1} mol^{-1})

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 J K^{-1} mol^{-1})

END OF THE QUESTION PAPER

Q.No.	Type	Section	Key/Range	Marks
1	MCQ	GA	A	1
2	MCQ	GA	C	1
3	MCQ	GA	B	1
4	MCQ	GA	B	1
5	MCQ	GA	B	1
6	MCQ	GA	A	2
7	MCQ	GA	D	2
8	MCQ	GA	D	2
9	MCQ	GA	B	2
10	MCQ	GA	C	2
1	MCQ	XL-P	A	1
2	MCQ	XL-P	D	1
3	MCQ	XL-P	D	1
4	NAT	XL-P	11 to 11	1
5	NAT	XL-P	4 to 4	1
6	MCQ	XL-P	D	2
7	MCQ	XL-P	D	2
8	MCQ	XL-P	A	2
9	MCQ	XL-P	D	2
10	MCQ	XL-P	A	2
11	MCQ	XL-P	C	2
12	MCQ	XL-P	B	2
13	NAT	XL-P	1.39 to 1.43	2

Q.No.	Type	Section	Key/Range	Marks
14	NAT	XL-P	7.39 to 7.54	2
15	NAT	XL-P	-13.40 to -13.36	2
1	MCQ	XL-Q	B	1
2	MCQ	XL-Q	A	1
3	MCQ	XL-Q	C	1
4	MCQ	XL-Q	C	1
5	MCQ	XL-Q	D	1
6	MCQ	XL-Q	C	1
7	MCQ	XL-Q	D	1
8	MCQ	XL-Q	B	1
9	NAT	XL-Q	12 to 12	1
10	NAT	XL-Q	50 to 50	1
11	MCQ	XL-Q	A	2
12	MCQ	XL-Q	A	2
13	MCQ	XL-Q	D	2
14	MCQ	XL-Q	B	2
15	MCQ	XL-Q	B	2
16	NAT	XL-Q	512 to 512	2
17	NAT	XL-Q	20 to 20	2
18	NAT	XL-Q	0.8 to 0.8	2
19	NAT	XL-Q	77 to 77	2
20	NAT	XL-Q	-8862 to -8862	2
1	MCQ	XL-R	A	1

Q.No.	Type	Section	Key/Range	Marks
2	MCQ	XL-R	B	1
3	MCQ	XL-R	C	1
4	MCQ	XL-R	D	1
5	MCQ	XL-R	B	1
6	MCQ	XL-R	C	1
7	MCQ	XL-R	A	1
8	MCQ	XL-R	A	1
9	MCQ	XL-R	B	1
10	NAT	XL-R	28.00 to 31.00	1
11	MCQ	XL-R	D	2
12	MCQ	XL-R	D	2
13	MCQ	XL-R	C	2
14	MCQ	XL-R	B	2
15	MCQ	XL-R	C	2
16	MCQ	XL-R	D	2
17	MCQ	XL-R	A	2
18	MCQ	XL-R	B	2
19	NAT	XL-R	20.25 to 20.25	2
20	NAT	XL-R	11.00 to 12.00	2
1	MCQ	XL-S	B	1
2	MCQ	XL-S	A	1
3	MCQ	XL-S	A	1
4	MCQ	XL-S	D	1

Q.No.	Type	Section	Key/Range	Marks
5	MCQ	XL-S	D	1
6	MCQ	XL-S	C	1
7	MCQ	XL-S	D	1
8	MCQ	XL-S	B	1
9	MCQ	XL-S	A	1
10	NAT	XL-S	1.38 to1.42	1
11	MCQ	XL-S	C	2
12	MCQ	XL-S	C	2
13	MCQ	XL-S	A	2
14	MCQ	XL-S	D	2
15	MCQ	XL-S	B	2
16	MCQ	XL-S	A	2
17	NAT	XL-S	2.60 to 2.80	2
18	NAT	XL-S	0.5 to 0.5	2
19	NAT	XL-S	45.50 to 46.50	2
20	NAT	XL-S	30.5 to 31.5	2
1	MCQ	XL-T	C	1
2	MCQ	XL-T	B	1
3	MCQ	XL-T	A	1
4	MCQ	XL-T	D	1
5	MCQ	XL-T	C	1
6	MCQ	XL-T	D	1
7	MCQ	XL-T	B	1

Q.No.	Type	Section	Key/Range	Marks
8	MCQ	XL-T	A	1
9	MCQ	XL-T	A	1
10	MCQ	XL-T	C	1
11	MCQ	XL-T	B	2
12	MCQ	XL-T	D	2
13	MCQ	XL-T	C	2
14	MCQ	XL-T	C	2
15	MCQ	XL-T	B	2
16	MCQ	XL-T	D	2
17	MCQ	XL-T	C	2
18	MCQ	XL-T	A	2
19	NAT	XL-T	5270 to 5310	2
20	NAT	XL-T	0.056 to 0.062	2
1	MCQ	XL-U	B	1
2	MCQ	XL-U	A	1
3	MCQ	XL-U	C	1
4	MCQ	XL-U	A	1
5	MCQ	XL-U	D	1
6	MCQ	XL-U	D	1
7	NAT	XL-U	1.55 to 1.65	1
8	NAT	XL-U	103.0 to 103.2	1
9	NAT	XL-U	54 to 56	1
10	NAT	XL-U	0 to 0	1

Q.No.	Type	Section	Key/Range	Marks
11	MCQ	XL-U	B	2
12	MCQ	XL-U	C	2
13	MCQ	XL-U	C	2
14	MCQ	XL-U	A	2
15	MCQ	XL-U	D	2
16	MCQ	XL-U	A	2
17	MCQ	XL-U	B	2
18	NAT	XL-U	9.8 to 10.2	2
19	NAT	XL-U	1.1 to 1.8	2
20	NAT	XL-U	10 to 10	2