PART (B) : CHEMISTRY

SECTION-I : (SINGLE ANSWER CORRECT TYPE)

This section contains **08 multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

21. A dilute aqueous solution of Na_2SO_4 is electrolyzed using platinum electrodes. The products at the anode and cathode are respectively.

(A) O_2, H_2 (B) $S_2O_8^{2-}, Na$ (C) O_2, Na (D) $S_2O_8^{2-}, H_2$

22. For a saturated solution of $AgCl$ at 25^oC, specific conductance is $3.41\times10^{-6}\Omega^{-1}cm^{-1}$ and that of water used for preparing the solution was $1.60\times10^{-6}\Omega^{-1}cm^{-1}$. The solubility product of $AgCl$ is is $[\wedge_{eq}^{\infty}(AgCl) = 138.30\,\Omega^{-1}cm^{-1}\,equiv^{-1}]$

(A) 1.31×10^{-5} (B) 1.74×10^{-8} (C) 1.71×10^{-10} (D) 3.24×10^{-4}

23. Given, $Pb^{2+}/Pb = -0.126\,V$; $Zn^{2+}/Zn = -0.763\,V$.
The emf of the following cell;
$Zn/Zn^{2+}(0.1M)\|Pb^{2+}(1M)/Pb$ is

(A) – 0.637 (B) + 0.66 (C) 0.637 (D) + 0.889

24. Consider the following sequence of reactions,

$$CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow{PCl_5} B \xrightarrow[\Delta]{Alc.KOH} C$$

The product C is

(A) Acetaldehyde (B) Acetylene (C) Ethylene (D) Acetyl chloride

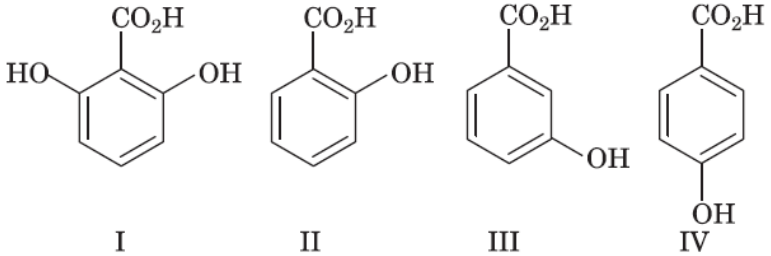
25. Select the incorrect statement among the following.

(A) The first ionization potential of Al is less than the first ionization potential of Mg
(B) The second ionization potential of Mg is greater than the second ionization potential of Na
(C) The first ionization potential of Na is less than the first ionization potential of Mg
(D) The first ionization potential of B is greater than first ionization potential of Al

26. One mole of an ideal gas expands against a constant external pressure of 1 atm from a volume of $10\,dm^3$ to a volume of 30 dm^3. What would be the work done in joules?

(A) – 2026 J (B) + 2026 J (C) – 1947 J (D) 1648 J

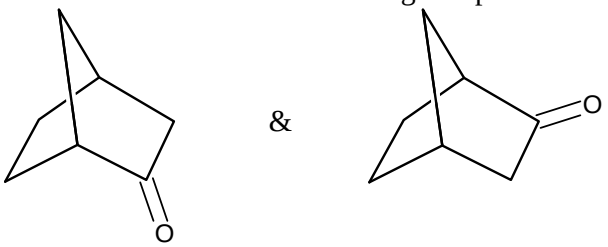
27. The correct order of acidity for the following compounds is



I II III IV

(A) I > II > III > IV (B) III > I > II > IV (C) III > IV > II > I (D) I > III > IV > II

28. What is the relation between following compounds?



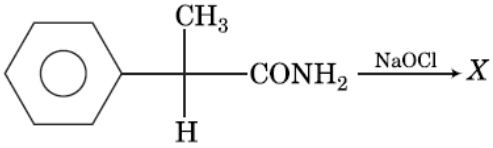
(A) Diastereoisomers
(B) Identical
(C) Enantiomers
(D) None of these

SECTION-II : (MULTIPLE CORRECT ANSWER(S) TYPE)

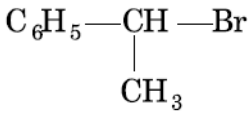
This section contains **06 multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE than one is/are correct.**

29. Which of the following is / are the correct statement(s) regarding defects in solids?
(A) Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion
(B) Frenkel defect is a dislocation defect
(C) Trapping of an electron in the lattice leads to the formation of F-centre
(D) Schottky defects have no effect on the physical properties of solids

30. Which of the following statement are true about the major product (X) in this reaction?

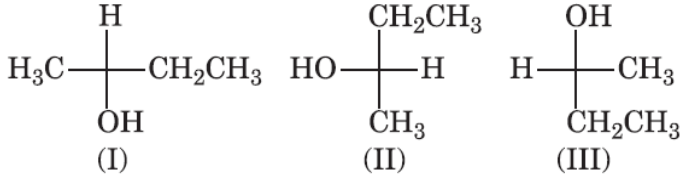


(A) It is a cyclic amide
(B) It has an asymmetric centre
(C) It is a primary amine
(D) It can also be obtained by treatment of excess NH_3 with



31. Which of the following compound(s) exhibit non zero dipole moment?
(A) 1,4-dichlorobenzene
(B) cis-1,2-dichloroethene
(C) trans-1,2-dichloroethene
(D) trans-1, 2-dichloro-2-pentene

32. Consider the following compounds and choose the correct statement.



(I) (II) (III)

(A) Structure I and II are identical
(B) All are identical
(C) Structure I and III are identical
(D) Structure I and III are different

33. The number of lone pair on iodine and number of d-orbitals used in hybridization by iodine are different in

(A) ICl_2^- (B) ICl_2^+ (C) IF_7 (D) ICl_4^-

34. A gas described by van der Waals' equation

(A) Behaves similar to an ideal gas in the limit of large molar volumes

(B) Behaves similar to an ideal gas in the limit of large pressures

(C) Is characterized by van der Waals' coefficients that are dependent on the identity of the gas but are independent of the temperature

(D) Has the pressure that is lower than the pressure exerted by the same gas behaving ideally

SECTION-III : (MATRIX-MATCH TYPE)

This section contains **02 Matrix Match**. Each question has matching lists. Each question has four choice (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

35. Match the thermodynamic processes given under Column I with the expressions given under

Column – I		Column – II	
P.	Freezing of water at 273 K and 1 atm.	**1.**	$q = 0$
Q.	Expansion of 1 mole of an ideal gas into a vacuum under isolated conditions.	**2.**	$\omega = 0$
R.	Mixing of equal volumes of two ideal gases at constant temperature and pressure in an isolated container.	**3.**	$\Delta S_{sys} < 0$
S.	Reversible heating of $H_2(g)$ at 1 atm from 300 K to 600 K, followed by reversible cooling to 300 K at 1 atm	**4.**	$\Delta U = 0$
		5.	$\Delta G = 0$

Codes:

	P	Q	R	S		P	Q	R	S
(A)	3,5	1,2,4	1,2,4	1,2,4,5	(B)	1,5	2,4	3,4	4,5
(C)	5,4	3,2,5	1,4	1,2	(D)	4,2	2,4	1,5,4	5,3

36. Match the Column I with Column II and choose the correct option.

Column – I		Column – II	
P.	$[CoF_6]^{3-}$	**1.**	Dimagnetic, low spin complex
Q.	$[Cr(C_2O_4)_3]^{3-}$	**2.**	Paramagnetic, outer orbital complex
R.	$[AuCl_4]^-$	**3.**	Paramagnetic, inner orbital complex
S.	$[Fe(CN)_6]^{3-}$	**4.**	Diamagnetic, high spin complex
		5.	Paramagnetic and low spin complex

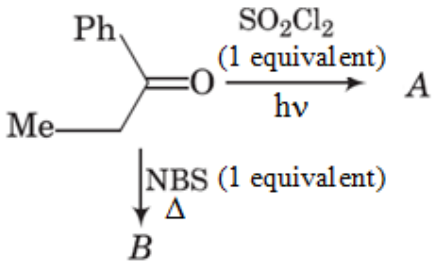
Codes:

	P	Q	R	S		P	Q	R	S
(A)	5	1	2	3	(B)	2	1	4	5
(C)	2	3	1	5	(D)	1	5	4	3

SECTION-IV : (INTEGER ANSWER TYPE)

This section contains **04** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, 0.33, 30.27, 127.30)

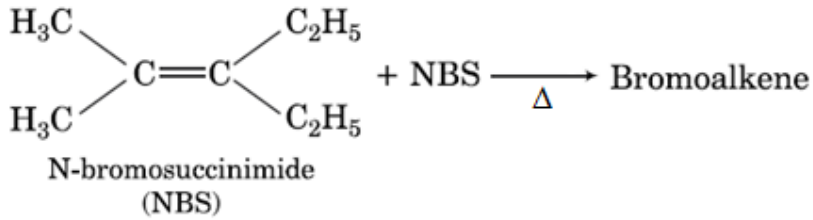
37. Consider the following reaction,



Sum of no. of isomeric products in A and B are

38. A total of $n \times 10^{20}$ energy levels are present in 3s conduction band of single crystal of sodium weighing 28.75 mg. What is the value of n? ($N_A = 6 \times 10^{23}$)

39. Following is free radical allylic bromination reaction



How many different monobromination product(s) are expected in the above reaction?

40. The volume (in mL) of 0.1 M $AgNO_3$ required for complete precipitation of chloride ions present in 30 mL of 0.01 M solution of $\left[Cr(H_2O)_5Cl\right]Cl_2$, as silver chloride is close to