Time : 1 Hour　　　　　　　　　　　　　　　　　　　**Total Marks : 100**

General Instructions :

1. *In Chemistry Section, there are 30 Questions (Q. no. 1 to 30) having Section A and B.*
2. *Section A consists of 20 multiple choice questions & Section B consists of 10 numerical value type questions. In Section B, candidates have to attempt any five questions out of 10.*
3. *There will be only one correct choice in the given four choices in Section A. For each question for Section A, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero mark will be awarded for not attempted question.*
4. *For Section B questions, 4 marks will be awarded for correct answer and zero for unattempted and incorrect answer.*
5. *Any textual, printed or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.*
6. *All calculations / written work should be done in the rough sheet is provided with Question Paper.*
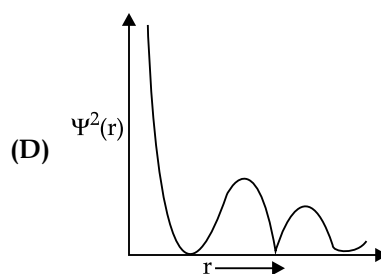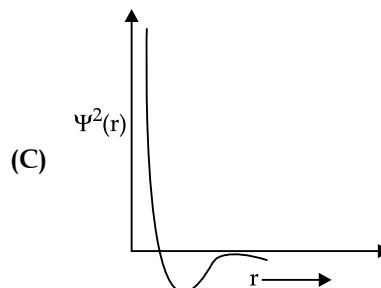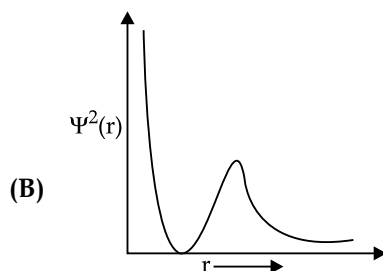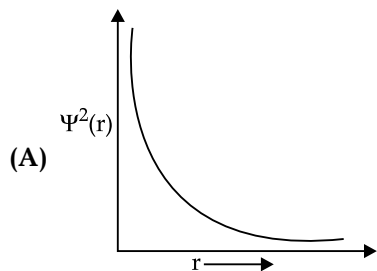
Chemistry

Section A

Q. 1. Using the rules for significant figures, the correct answer for the expression $\dfrac{0.02858 \times 0.112}{0.5702}$ will be

(A) 0.005613　　　　**(B)** 0.00561

(C) 0.0056　　　　　**(D)** 0.006

Q. 2. Which of the following is the correct plot for the probability density $\Psi^2(r)$ as a function of distance 'r' of the electron from the nucleus for 2s orbitals ?

(A)

(B)

(C)

(D) $\Psi^2(r)$

Q. 3. Consider the species CH_4, NH_4^+ and BH_4^-. Choose the correct option with respect to these species.

(A) They are isoelectronic and only two have tetrahedral structures.

(B) They are isoelectronic and all have tetrahedral structures.

(C) Only two are isoelectronic and all have tetrahedral structures.

(D) Only two are isoelectronic and only two have tetrahedral structures.

Q. 4. 4.0 moles of argon and 5.0 moles of PCl_5 are introduced into an evacuated flask of 100 litre capacity at 610 K. The system is allowed

to equilibrate. At equilibrium, the total pressure of mixture was found to be 6.0 atm. The K_p for the reaction is

[Given : R = 0.082 L atm K^{-1} mol^{-1}]

(A) 2.25   (B) 6.24
(C) 12.13   (D) 15.24

Q. 5. A 42.12% (w/v) solution of NaCl causes precipitation of a certain sol in 10 hours. The coagulating value of NaCl for the sol is [Given: Molar Mass : Na = 23.0 g mol^{-1}; Cl = 35.5 g mol^{-1}]

(A) 36 mmol L^{-1} (B) 36 mol L^{-1}
(C) 1440 mol L^{-1} (D) 1440 mmol L^{-1}

Q. 6. Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : The first ionization enthalpy for oxygen is lower than that of nitrogen.

Reason (R) : The four electrons in $2p$ orbitals of oxygen experience more electron-electron repulsion.

In the light of the above statements, choose the correct answer from the options given below.

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(B) Both (A) and (R) are correct and (R) is **NOT** the correct explanation of (A).
(C) (A) is correct but (R) is not correct.
(D) (A) is not correct but (R) is correct.

Q. 7. Match List I with List II.

	List- I		**List-II**
a.	Siderite	I.	$FeCO_3$
b.	Malachite	II.	$CuCO_3 . Cu(OH)_2$
c.	Sphalerite	III.	ZnS
d.	Calamine	IV.	$ZnCO_3$

Choose the correct answer from the option given below.

(A) a-I, b-II, c-III, d-IV
(B) a-III, b-IV, c-II, d-I
(C) a-IV, b-III, c-I, d-II
(D) a-I, b-II, c-IV, d-III

Q. 8. Given below are two statements.
- **Statement I :** In $CuSO_4.5H_2O$, Cu-O bonds are present.
- **Statement II :** In $CuSO_4.5H_2O$, ligands coordinating with Cu(II) ion are O- and S based ligands.

In the light of the above statement, choose the correct answer from the options given below

(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.

(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

Q. 9. Amongst baking soda, caustic soda and washing soda, carbonate anion is present in

(A) washing soda only
(B) washing soda and caustic soda only
(C) washing soda and baking soda only
(D) baking soda, caustic soda and washing soda

Q. 10. Number of lone pair(*s*) of electrons on central atom and the shape of BrF_3 molecule respectively are

(A) 0, triangular planar (B) 1, pyramidal
(C) 2, bent- T-shape (D) 1, bent T-shape

Q. 11. Aqueous solution of which of the following boron compounds will be strongly basic nature?

(A) $NaBH_4$ (B) $LiBH_4$
(C) B_2H_6 (D) $Na_2B_4O_7$

Q. 12. Sulphur dioxide is one of the components of polluted air, SO_2 is also a major contributor to acid rain. The correct and complete reaction to represent acid rain caused by SO_2 is.

(A) $2SO_2 + O_2 \rightarrow 2SO_3$
(B) $SO_2 + O_3 \rightarrow SO_3 + O_3$
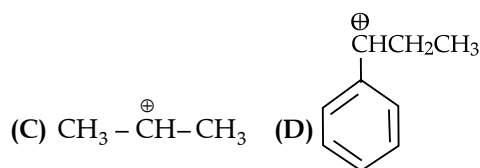(C) $SO_2 + H_2O_2 \rightarrow H_2SO_4$
(D) $2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$

Q. 13. Which of the following carbocation's is most stable ?
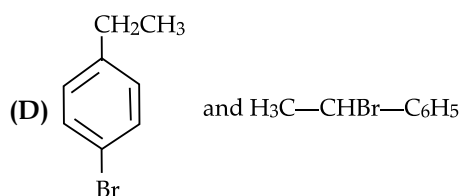

(A)   (B)
(C)   (D)
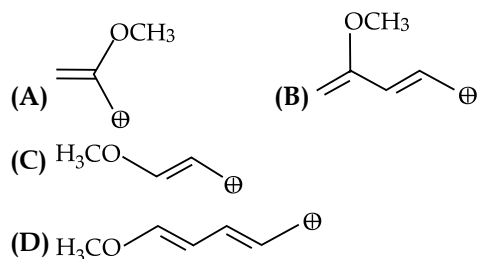
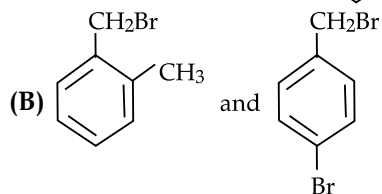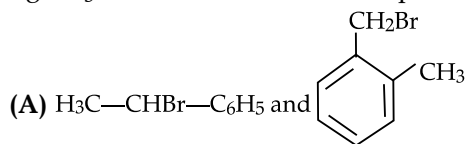**Q. 14.** The stable carbocation formed in the below reaction is

(A) $CH_3CH_2 \overset{\oplus}{C}H_2$ (B) $CH_3 \overset{\oplus}{C}H_2$

(C) $CH_3 - \overset{\oplus}{C}H-CH_3$ (D)
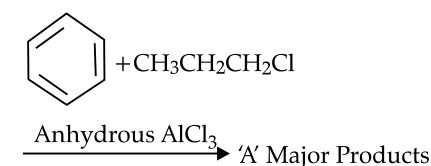
Q. 15. Two isomers (A) and (B) with molar mass 184 g /mol and elemental composition C 52.2%; H 4.9% and Br 42.9% gave benzoic acid and *p*-bromobenzoic acid, respectively on oxidation with $KMnO_4$. Isomer 'A' is optically active and gives a pale yellow precipitate when warmed with alcoholic $AgNO_3$. Isomer 'A' and 'B' are, respectively :

(A) H_3C—CHBr—C_6H_5 and

CH₂Br

CH₃

(B)

CH₂Br

CH₃

and

CH₂Br

Br

(C) H_3C—CHBr—C_6H_5 and

CH₂CH₃

Br

(D)

CH₂CH₃

Br

and H_3C—CHBr—C_6H_5
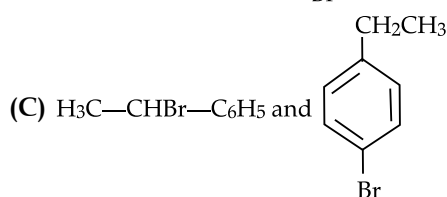
Q. 16. In Friedel-Crafts alkylation of aniline, one gets :

(A) alkylated product with *ortho* and *para* substitution

(B) secondary amine after acidic treatment

(C) an amide product

(D) positively charged nitrogen at benzene ring

Q. 17. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Dacron is an example of polyester polymer.

Reason (R) : Dacron is made up of ethylene glycol and terephthalic acid monomers.

In the light of the above statement, choose the most appropriated answer from the options given below :

(A) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**

(B) Both **(A)** and **(R)** are correct but **(R)** is **NOT** the correct explanation of **(A).**

(C) **(A)** is correct but **(R)** is not correct.

(D) **(A)** is not correct but **(R)** is correct.

Q. 18. The structure of protein that is unaffected by heating is :

(A) secondary structure

(B) tertiary structure

(C) primary structure

(D) quaternary structure

Q. 19. The mixture of chloroxylenol and terpineol is an example of :

(A) antiseptic   (B) pesticide

(C) disinfectant   (D) narcotic analgesic

Q. 20. A white precipitate was formed when $BaCl_2$ was added to extract of an inorganic salt. Farther, a gas 'X' with characteristic odour was released when the formed white precipitate was dissolved in dilute HCl. The anion present in the inorganic salt is :

(A) I^- (B) SO_3^{2-}

(C) S^{2-} (D) NO_2^-

Section B

Q. 21. A box contains 0.90 g of liquid water in equilibrium with water vapour at 27°C. The equilibrium vapour pressure of water at 27°C is 32.0 Torr. When the volume of the box is increased, some of the liquid water evaporates to maintain the equilibrium pressure. If the liquid water evaporates, then the volume of the box must be —— litre. (nearest integer) R = 0.0821 L atm K^{-1} mol^{-1}

(Ignore the volume of the liquid water and assume water vapours behave as an ideal gas).

Q. 22. 2.2 g of nitrous oxide (N_2O) gas is cooled at a constant pressure of 1 atm from 310 K to 270K causing the compression of the gas from 217.1 mL to 167.75 mL. The change in internal energy of the process, ΔU is '–x' J. The value of 'x' is _____.

(Nearest integer)

(Given : atomic mass of N = 14 g mol^{-1} and of O = 16 g mol^{-1}, Molar heat capacity of N_2O is 100 J K^{-1} mol^{-1})

Q. 23. Elevation in boiling point for 1.5 molal solution of glucose in water is 4 K. The depression in freezing point of 4.5 molal solution of glucose in water is 4 K. The ratio of molal elevation constant to molal depression constant (K_b/K_f) is _____.

Q. 24. The cell potential for the given cell at 298 K

$Pt | H_2 (g, 1 bar) | H^+(aq) || Cu^{2+} (aq) | Cu(s)$

is 0.31 V. The pH of the acidic solution is found to be 3, whereas the concentration of Cu^{2+} is 10^{-x} M. The value of x is _____.

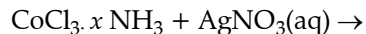[Given: ($E_{Cu^{2+}/Cu} = 0.34V$ and $\dfrac{2.303\ RT}{F} = 0.06\ V$)]

Q. 25. The equation

$k = (6.5 \times 10^{12}s^{-1})e^{-26000K/T}$

is followed for the decomposition of compound A. The activation energy for the

reaction is _____kJ mol^{-1}. (Nearest integer)

(Given : R = 8.314 JK^{-1} mol^{-1})

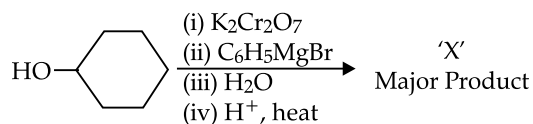**Q. 26.** Spin only magnetic moment of $[MnBr_6]^{4-}$ is _____B.M. (Round off to the closest integer)

Q. 27. For the reaction given below :

$CoCl_3 . x\ NH_3 + AgNO_3(aq) \rightarrow$

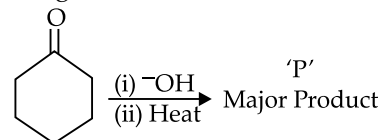If two equivalents of AgCl precipitate out, then the value of x will be _____.

Q. 28. The number of chiral alcohol (s) with molecular formula $C_4H_{10}O$ is ____.

Q. 29. In the given reaction,

the number of sp^2 hybridised carbon (s) in compound 'X' is _____.

Q. 30. In the given reaction,

The number of π electrons present in the product 'P' is ___.

Answer Key

Q. No.	Answer	Topic Name	Chapter Name
Section (A)			
1	B	Significant figures	Some basic concepts of chemistry
2	B	Concept of Orbital	Structure of Atom
3	B	VSEPR theory	Chemical Bonding and Molecular Structure
4	A	Equilibrium	Equilibrium
5	D	Surface chemistry	Surface chemistry
6	A	General characteristics of p-Block elements	Some p-Block Elements
7	A	Ores	General principle and process of isolation of Elements
8	C	Coordination Compounds	Coordination Compounds
9	A	Chemical Bonding and Molecular Structure	Chemical Bonding and Molecular Structure
10	C	VSEPR theory and Hybridisation	Chemical Bonding and Molecular Structure
11	D	Acids and bases	Equilibrium
12	D	Environmental Chemistry	Environmental Chemistry
13	D	Reaction Intermediates	Organic Chemistry Some Basic Principles and Techniques
14	C	Aromatic Hydrocarbons	Hydrocarbons
15	C	Haloalkanes and Haloarenes	Haloalkanes and Haloarenes
16	D	Chemical properties of Aniline	Organic Compounds Containing Nitrogen
17	A	Polymer	Polymer
18	C	Proteins	Biomolecules
19	A	Chemistry in Everyday Life	Chemistry in everyday life
20	B	Chemical properties of s-block elements	s-Block Elements (Alkali and Alkaline Earth Metals)
Section (B)			
21	29	Ideal gas equation	States of Matter : Gases and Liquids
22	195	Internal energy	Thermodynamics
23	3:1	Colligative properties	Solutions
24	7	Nernst Equation	Electrochemistry
25	216	Arrhenius equation	Chemical Kinetics
26	7	Magnetic properties	Coordination Compounds
27	5	Coordination Compounds	Coordination Compounds
28	1	Chirality (Stereochemistry)	Alcohols, Phenols and Ethers
29	8	Chemical properties of alcohols	Alcohols, Phenols and Ethers
30	4	Chemical properties of carbonyl compounds	Aldehydes, Ketones and Carboxylic acids

ANSWERS WITH EXPLANATIONS

Chemistry

Section A

1. Option (B) is correct.
Explanation :
$0.002858 \times 0.112/0.5702 = 0.000561$
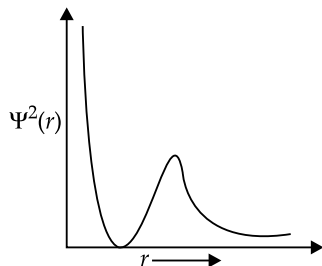Number of significant fig. in $0.002858 = 4$
Number of significant fig. in $0.112 = 3$
Number of significant fig. in $0.5702 = 4$
Hence, 0.00561 has three significant figures.

2. Option (B) is correct.
Explanation :

Plot of $\psi^2(r)$ v/s 'r' for $2s$ orbital of single electron species.
For $2s$ orbital,
$n = 2, l = 0$
So, radial node $= n - l - 1$
$\qquad\qquad = 2 - 0 - 1$
$\qquad\qquad = 1$
Hence, there is 1 radial node present.
The value of ψ^2 is always positive.

3. Option (B) is correct.
Explanation :
Number of electrons in $CH_4 = 6 + 4 = 10$
Number of electrons in $NH_4^+ = 7 + 4 - 1 = 10$
Number of electrons in $BH_4^- = 5 + 4 + 1 = 10$
Since, CH_4, NH_4^+ and BH_4^-, all have equal number of electrons, i.e., 10, so these compounds are isoelectronic.
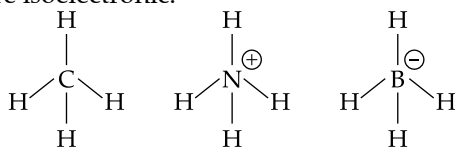
They all have tetrahedral structures (sp^3 hybridisation).

4. Option (A) is correct.
Explanation : Given $PCl_5 = 5.0$ mole
$n_{PCl_5} = 5, n_{Ar} = 4$
$V = 100$ L, $T = 610$ K.
$$PV = nRT$$
$$P_{Total} = \frac{n_{Total}\,RT}{V}$$
$$P_{Total} = \frac{9 \times 0.082 \times 610}{100}$$
$$= 4.5 \text{ atm}$$
So, $\quad p_{PCl_5} = \dfrac{n_{PCl_5} \times P_{Total}}{n_{Total}} = \dfrac{5}{9} \times 4.5 = 2.5$ atm

$$p_{Ar} = \frac{n_{Ar} \times P_{Total}}{n_{Total}} = \frac{4}{9} \times 4.5 = 2 \text{ atm}$$

$$PCl_5 \rightleftharpoons PCl_3 + Cl_2$$
At t = 0 $\qquad$ 2.5 $\qquad$ 0 $\qquad$ 0
At t = t_{eq} 2.5 – x $\qquad$ x $\qquad$ x
$\qquad P_{Total} = 2.5 - x + x + x + P_{Ar}$
$\qquad\qquad 6 = 2.5 + x + 2$
$\qquad\qquad x = 1.5$
So, at eq^m, $p_{PCl_5} = 2.5 - 1.5 = 1$

$$p_{PCl_3} = 1.5, \quad p_{Cl_2} = 1.5$$

$$K_P = \frac{[p_{PCl_3}][p_{Cl_2}]}{[p_{PCl_5}]}$$
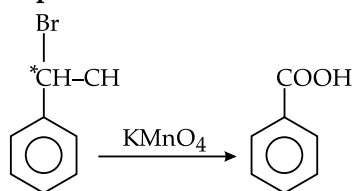
$$K_P = \frac{1.5 \times 1.5}{1}$$
$$K_P = 2.25$$

5. Option (D) is correct.
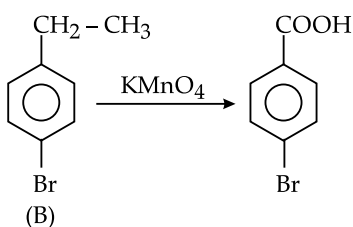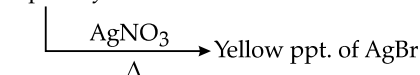**Explanation :** Given : 42.12 g NaCl in 100 mL solution.
Molar mass of Na $= 23.0$ g mol^{-1}
Molar mass of Cl $= 35.5$ g mol^{-1}
Molarity (M) = n/V

$$M = \frac{42.12 \times 1000}{(23 + 35.5) \times 100}$$

$$M = \frac{42.12 \times 10}{58.5}$$

$$= 7.2$$

Coagulation value = Number of milli mole of electron/Volume of solution

Number of milli mole of electron = 7200

Coagulation value for 10 hours = 7200

Coagulation value for 2 hours

$$= \frac{7200}{10} \times 2$$

$$= 1440 \text{ m mol L}^{-1}$$

6. Option (A) is correct.

Explanation : Oxygen has lower ionisation energy than that of nitrogen because the electronic configuration of nitrogen has half-filled stability whereas for oxygen it is partially filled. It is easier to remove the electron from partially filled oxygen atom as in doing so it attains half-filled stability. In the case of nitrogen, it required more energy to remove an electron from half-filled or full filled orbitals.

Electronic configuration of $O = 1s^2\, 2s^2\, 2p^6$

Electronic configuration of $N = 1s^2\, 2s^2\, 2p^3$

Ionisation energy N > O. In oxygen atom, 2 of the 4 $2p$ electrons must occupy the same $2p$ orbital resulting in an increased electron electron-repulsion.

7. Option (A) is correct.

Explanation : Siderite — $FeCO_3$

Malachite — $CuCO_3.Cu(OH)_2$

Calamine — $ZnCO_3$

Sphalerite — ZnS

8. Option (C) is correct.

Explanation :

A covalent bond is formed between sulphur and oxygen as they both are non metals and the bond between copper and sulphate is ionic one is metal and other non metal. Hydrated copper sulphate is a complex which is bonded to water molecules acting as ligands forming coordinate bond.

9. Option (A) is correct.

Explanation : Baking soda : $NaHCO_3$, Washing soda : $Na_2CO_3. 10H_2O$ and Caustic soda : $NaOH$. Bicarbonate anion (HCO_3^-) is present in baking soda, OH^- is present in caustic soda and CO_3^{2-} anion is present in washing soda.

So, only washing soda contains carbonate anion.

10. Option (C) is correct.

Explanation : In BrF_3 molecule, there are 2 lone pairs and 3 bond pairs of electrons. The central Br atom undergoes sp^3d hybridisation. The expected geometry of BrF_3 is trigonal bipyramidal and actual geometry is T-shaped since 2 of the orbitals are occupied by lone pairs.

Bent T-shaped

11. Option (D) is correct.

Explanation : $Na_2B_4O_7$ gives H_3BO_3 and $NaOH$ in water.

Reaction : $Na_2B_4O_7 + H_2O \rightarrow H_3BO_3 + NaOH$

Weak   Strong

acid   base

An aqueous solution of borax $Na_2B_4O_7$ is basic in nature as it on hydrolysis produces H_3BO_3 (a weak acid) and $NaOH$ (a strong base).

12. Option (D) is correct.

Explanation : Sulphur dioxide and Sulphur trioxide react with water to form H_2SO_4 which causes acid rain.

$$S + O_2 \rightarrow SO_2$$

$$2SO_2 + O_2 \rightarrow 2SO_3$$

$$SO_3 + H_2O \rightarrow H_2SO_4$$

13. Option (D) is correct.

Explanation : The order of stability of carbocation is 3º > 2º > 1º

The greater is the delocalisation of charge, more is the stability of carbocation.

14. Option (C) is correct.

Explanation :

After 1, 2-Hydride shift, 1° carbocation is converted to 2° carbocation.

15. Option (C) is correct.
Explanation :

(A)
Optically Active

AgNO$_3$ / Δ → Yellow ppt. of AgBr

(B)

16. Option (D) is correct.
Explanation : Since, anniline does not undergo Friedel-Crafts alkylation because of salt formation with AlCl$_3$. So, because of this nitrogen acquires positive charge.

17. Option (A) is correct.
Explanation :

Ethylene glycol   Terephthalic acid
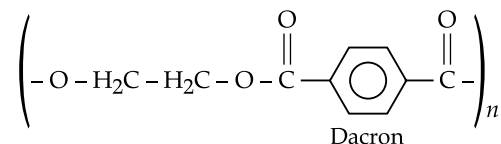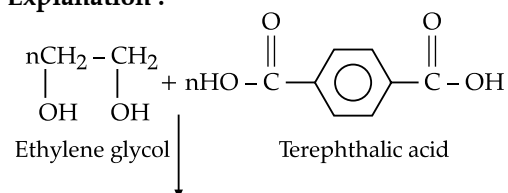
Dacron

Dacron (or terylene) is an example of polyester polymer and it is made up of ethylene glycol and terephthalic acid monomers.

18. Option (C) is correct.
Explanation : Primary structure of protein is unaffected by physical changes or chemical changes.
Since, primary structure of protein is straight chain of amino acids which are held together by covalent peptide bond and is not disrupted on heating.

While on heating, the helix gets uncoiled and globules gets unfold, so secondary and tertiary structures are destroyed.

19. Option (A) is correct.
Explanation : Mixture of chloroxylenol and terpineol is known as Dettol. It acts as an antiseptic. It is applied to living tissue as it kills bacteria and stops their growth, preventing further infections.

20. Option (B) is correct.
Explanation :

$$BaCl_2 + SO_3^{2-} \rightarrow BaSO_3 \downarrow \xrightarrow{\text{dil. HCl}} SO_2 \uparrow$$

white   (X)
burning sulphur like smell

So, the anion present in the inorganic salt is SO_3^{2-}.

Section B

21. Correct answer is [29].
Explanation : Since, 760 Torr = 1 atm
∴ 32 Torr = 32/760 atm
As all the liquid water evaporates so entire water is in gaseous state.
Weight of water vapour = 0.9 g

∴ Moles of water vapour (n) = $\dfrac{\text{Given mass}}{\text{Molecular mass}}$

$$= \frac{0.9}{18}$$

Pressure (P) = 32/760 atm
Temperature (T) = (27 + 273) K = 300 K
R = 0.082 L atm K^{-1} mol^{-1}
Given water vapour act as an ideal gas, so we can apply ideal gas equation.
From ideal gas equation,
PV = n RT

$$\frac{32}{760} \times V = \frac{0.9}{18} \times 0.082 \times 300$$

$$V = \frac{0.9 \times 0.082 \times 300 \times 760}{32 \times 18}$$

$$V = 29.21 \text{ L}$$
$$= 29 \text{ L (nearest integer)}$$

22. Correct answer is [195].
Explanation :
T$_1$ = 310 K, T$_2$ = 270 K
ΔT = T$_2$ – T$_1$ = 270 K – 310 K = – 40 K

$$q_p = n\, C_p\, \Delta T$$

$$= \frac{2.2}{44} \times 100 \times (-40)$$

$$= -200 \text{ J}$$

$$\Delta V = V_2 - V_1 = (167.75 - 217.1) \text{ mL}$$

$$= 49.35 \text{ mL}$$

$$w = -P_{ext} \times DV$$

$$w = -(1) \times \frac{(-49.35)}{1000} \text{ atm L}$$

$$w = +0.04935 \text{ atm L}$$

$$w = 0.04935 \times 101.3 \text{ J}$$

$$w = 4.99 \text{ J} \sim 5 \text{ J}$$

$$\Delta U = q + w$$

$$= -200 + 5$$

$$= -195 \text{ J}$$

So, the value of x is 195.

23. Correct answer is [3 : 1].

Explanation :

$$\Delta T_b = K_b m_1 \qquad \qquad ...(1)$$

$$\Delta T_f = K_f m_2 \qquad \qquad ...(2)$$

Given, $m_1 = 1.5 \text{ m}$

$\quad\quad\quad m_2 = 4.5 \text{ m}$

$\quad\quad\quad \Delta T_b = 4 \text{ K}$

$\quad\quad\quad \Delta T_f = 4 \text{K}$

Dividing (1) by (2)

$$\frac{\Delta T_b}{\Delta T_f} = \frac{K_b m_1}{K_f m_2}$$

$$\frac{4}{4} = \frac{K_b \times 1.5}{K_f \times 4.5}$$

$$\frac{K_b}{K_f} = \frac{4.5}{1.5} = \frac{3}{1}$$

So, $K_b : K_f = 3 : 1$
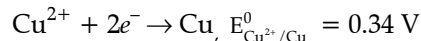
24. Correct answer is [7].
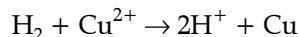
Explanation : Given cell :

$\text{Pt} | H_2(g) | H^+(aq) || Cu^{2+}(aq) | Cu(s)$
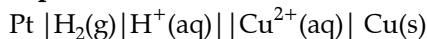
Oxidation Half reaction :
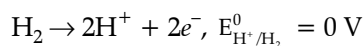
$$H_2 \rightarrow 2H^+ + 2e^-, \ E^0_{H^+/H_2} = 0 \text{ V}$$

Reduction Half reaction :

$$Cu^{2+} + 2e^- \rightarrow Cu, \ E^0_{Cu^{2+}/Cu} = 0.34 \text{ V}$$

Net cell reaction :

$$H_2 + Cu^{2+} \rightarrow 2H^+ + Cu$$

$$E^0_{cell} = E^0_{cathode} - E^0_{anode}$$

$$E^0_{cell} = (0.34 - 0) \text{ V} = 0.34 \text{ V}$$

Now, pH of the acidic solution = 3 (given)

$$pH = -log_{10}[H^+]$$

$$3 = -log_{10}[H^+]$$

$$\Rightarrow \quad [H^+] = 10^{-3} \text{ M}$$

$$[Cu^{2+}] = 10^{-x} \text{ M}$$

$$E_{cell} = 0.31 \text{ V (given)}$$

Applying Nernst equation,

$$E_{cell} = E^0_{cell} - \frac{2.303 RT}{nF} log \frac{[H^+]^2}{[Cu^{2+}]}$$

$$0.31 = 0.34 - \frac{0.06}{2} log \frac{(10^{-3})^2}{10^{-x}}$$

$$0.31 = 0.34 - 0.03 \log (10^{-6-(-x)})$$

$$-0.03 = -0.03 \log 10^{-6+x}$$

$$1 = \log 10^{-6+x}$$

$$1 = (-6+x) \log 10$$

$$x = 1 + 6 = 7 \qquad [\because \log 10 = 1]$$

So, the value of x is 7.

25. Correct answer is [216].

Explanation : Given,

$$k = (6.5 \times 10^{12}) e^{-\frac{26000 \text{ K}}{T}} \qquad ...(1)$$

Arrhenius eq : $\quad k = A e^{-E_a/RT} \qquad ...(2)$

On comparing (1) & (2), we get

$$\frac{E_a}{RT} = \frac{26000}{T}$$

$$E_a = 26000 \times R$$

$$E_a = 26000 \text{ K} \times 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$$

$$E_a = 216164 \text{ J mol}^{-1}$$

$$E_a = 216.164 \text{ kJ mol}^{-1}$$

$$E_a = 216 \text{ kJ mol}^{-1} \text{ (nearest integer)}$$
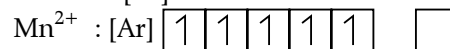
26. Correct answer is [7].

Explanation : $[MnBr_6]^{4-}$

$$x - 6 = -4$$

$$x = +2$$

$$\text{Mn} = [Ar] 3d^5 4s^2$$

$$\text{Mn}^{2+} = [Ar] 3d^5 4s^0$$

Mn^{2+} : [Ar] ↑|↑|↑|↑|↑   ☐

$\quad\quad\quad\quad\quad\quad 3d \quad\quad\quad\quad 4s$

So, number of unpaired electrons $(n) = 5$

$$\mu = \sqrt{n(n+2)}$$

$$\mu = \sqrt{5(5+2)}$$

$$= \sqrt{35}$$

$$= 5.91 \text{ B.M.}$$

$$\approx 6 \text{ B.M.}$$

27. Correct answer is [5].

Explanation :

$$CoCl_3 . xNH_3 + AgNO_3 \rightarrow AgCl\downarrow$$
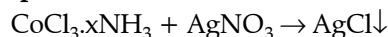
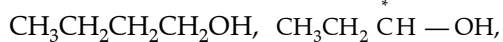$$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad 2 \text{ mol}$$

Two equivalents of AgCl precipitates out, which symbolises that there are two free Cl⁻ ions. The coordination number of Co is six. So, the ligands inside the coordination sphere should be six. Hence, the complex should be $[Co(NH_3)_5Cl]Cl_2$.

$$[Co(NH_3)_5Cl]Cl_2 + AgNO_3 \rightarrow AgCl\downarrow$$
$$2\ mol$$

Hence, the value of x is 5.

28. Correct answer is [1].
Explanation : Molecular formula is $C_4H_{10}O$.
So, all possible structures of alcohols are :

$$CH_3CH_2CH_2CH_2OH, \quad CH_3CH_2\overset{*}{C}H-OH,$$
$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad | $$
$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad CH_3$$
$$\qquad(A)\qquad\qquad\qquad\qquad(B)$$
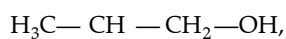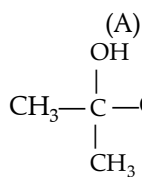
$$\begin{matrix} & OH & \\ & | & \\ CH_3-&C&-CH_3 \\ & | & \\ & CH_3 & \end{matrix} \qquad H_3C-CH-CH_2-OH,$$
$$\qquad\qquad\qquad\qquad\qquad\qquad | $$
$$\qquad\qquad\qquad\qquad\qquad\qquad CH_3$$
$$\qquad(C)\qquad\qquad\qquad\qquad(D)$$
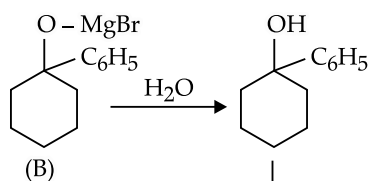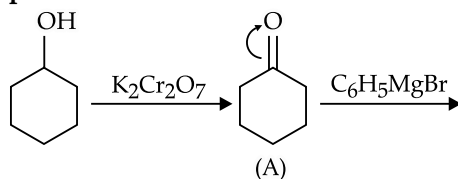
Out of (A), (B), (C) and (D) only (B) is a chiral alcohol.
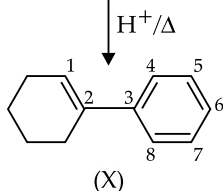
So, number of chiral alcohol with molecular formula $C_4H_{10}O$ is 1.

29. Correct answer is [8].
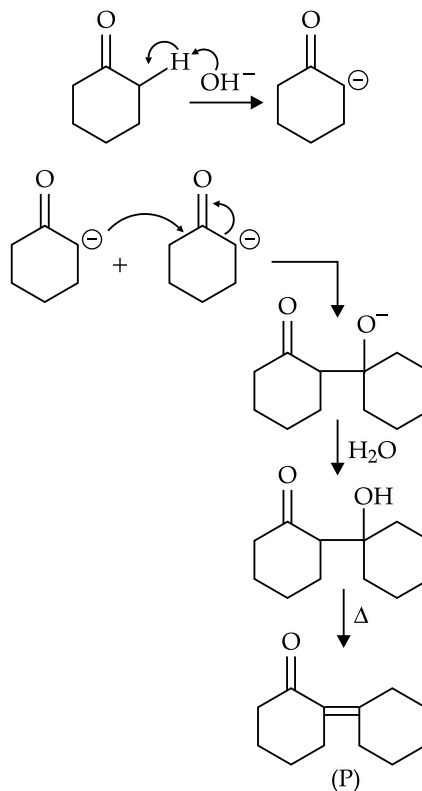**Explanation :**

So, there are 8 sp^2 hybridised carbon atom in compound X.

30. Correct answer is [4].
Explanation :

In compound 'P', there are 4 π electrons.