1. Most stable trihalide from NF₃, NBr₃, NCl₃, & NI₃ is
   (1) NF₃ (2) NCl₃ (3) NBr₃ (4) NI₃

   Ans. (1)

   Sol. NF₃ is stable while NCl₃, NBr₃, NI₃ are explosive
2. Atom 'X' arranged in HCP unit cell while Y atom occupy \( \frac{2}{3} \) tetrahedral voids then % of X in unit cell.

[Report your answer to nearest integer]

Ans. (43)

Sol. X = 6[HCP unit cell]

\[ Y = \frac{2}{3} \times [TV] = \frac{2}{3} \times 12 = 8 \]

Formula = \( X_8Y_8 \Rightarrow X_8Y_4 \)

% of X in unit cell = \( \frac{3}{7} \times 100 = 42.857 \approx 43 \]

3. which set of quantum number represent degenerate orbital

(a) \( n = 3, \ell = 2, m = 0, s = \frac{1}{2} \) & \( n = 3, \ell = 2, m = -1, s = \frac{-1}{2} \)

(b) \( n = 2, \ell = 1, m = 1, s = \frac{-1}{2} \) & \( n = 3, \ell = 1, m = 1, s = \frac{1}{2} \)

(c) \( n = 4, \ell = 2, m = -1, s = \frac{1}{2} \) & \( n = 3, \ell = 2, m = -1, s = \frac{-1}{2} \)

(1) a  (2) b  (3) c  (4) a, b

Ans. (1)

Sol. The orbitals with same \( n \) & \( \ell \) value but with different \( m \) value are degenerate

4. Emf of the following cell

Pt(s) \( \text{H}_2(g) \) (1 atm) \( \text{H}^+(aq) \) Cu(s) \( 0.01 \text{ M} \) Cu(s) is 0.576 V

then find pH of anodic half-cell given

\[ E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V} \]

\[ \frac{2.303RT}{F} = 0.06 \]

[Report your answer to nearest integer]

Ans. (5)

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5. CuHx is used as rocket fuel then find mass of oxygen used for per lit consumption of CuHx also find mass of CO2 produced. Given density of CuHx = 0.756 gram/ml

(1) 2592 gram, 2376 gram  (2) 2376 gram, 2592 gram

(3) 2592 gram, 2688 gram  (4) 2688 gram, 2776 gram

Ans. (1)

Sol. density = \( \frac{mass}{volume} \)
6. What is concentration of a glucose solution in interavenous injection in gram/lit which is isotonic with blood solution which has osmotic pressure 7.93 bar at 300 K. [Report your answer to nearest integer]

Ans. (58)

7. Which ion is not present in teeth enamel?

(1) Ca\(^{2+}\)  (2) F\(^-\)  (3) P\(^{3+}\)  (4) P\(^{6+}\)

Ans. (3)

8. How many of the following oxides are amphoteric in nature?

(a) Na₂O  (b) As₂O₃  (c) NO  (d) NaO  (e) Cl₂O₅

Ans. (2)

9. A cation Y\(^+\) on reaction with reagent X form red colour complex then cation Y\(^+\) and reagent X are respectively:

(1) Ni\(^{3+}\), ammonical solution of dimethylglyoxime  (2) Cu\(^{2+}\), K₄Fe(CN)₆  (3) Fe\(^{3+}\), K₄Fe(CN)₆  (4) Zn\(^{2+}\), NH₃(aq) (excess)

Ans. (1)
10. Which is used for commercial production of dihydrogen.

(1) Carbon (2) Oxygen (3) Chlorine (4) Nitrogen

Ans. (1)

---

11. Match the Column.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) PC₆₅</td>
<td>(a) SP²</td>
</tr>
<tr>
<td>(ii) Pt(CN)₄²⁻</td>
<td>(b) SP³</td>
</tr>
<tr>
<td>(iii) [Co(NH₃)₆]³⁺</td>
<td>(c) dSP³</td>
</tr>
<tr>
<td>(iv) BrF₅</td>
<td>(d) dSP²</td>
</tr>
</tbody>
</table>

Correct matching is:

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>b</td>
<td>d</td>
<td>c</td>
<td>a</td>
</tr>
<tr>
<td>(ii)</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>(iii)</td>
<td>d</td>
<td>b</td>
<td>a</td>
<td>c</td>
</tr>
<tr>
<td>(iv)</td>
<td>c</td>
<td>d</td>
<td>b</td>
<td>a</td>
</tr>
</tbody>
</table>

Ans. (1)

12. An Co₂(CO)₈

no. of Co-Co bonds = X
Terminal Co–CO bonds = Y
then (X+Y) is ________.

Ans. (9)

Sol. Co₂(CO)₈

No. of Co – Co bond = X = 1
No. of Co – Co bond = Y = 8
X + Y = 9
13. Match the List,

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Calamine &amp; (a) ZnS</td>
<td></td>
</tr>
<tr>
<td>(ii) Sphalerite &amp; (b) ZnCO₃</td>
<td></td>
</tr>
<tr>
<td>(iii) Galena &amp; (c) PbS</td>
<td></td>
</tr>
<tr>
<td>(iv) Siderite &amp; (d) FeCO₃</td>
<td></td>
</tr>
</tbody>
</table>

Identity correct match:

1. a b c d
2. b a c d
3. b a d c
4. d c b a

Ans. (2)

Sol.

<table>
<thead>
<tr>
<th>Calamine</th>
<th>ZnCO₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphalerite</td>
<td>ZnS</td>
</tr>
<tr>
<td>Galena</td>
<td>PbS</td>
</tr>
<tr>
<td>Siderite</td>
<td>FeCO₃</td>
</tr>
</tbody>
</table>

14. Among the following statements correct set of statements is.

(a) B₄H₆ is Lewis acid
(b) B₂H₆ has planar structure
(c) All B-H bond lengths are equal in B₂H₆
(d) In B₂H₆ four 3c-2e bonds are present
(e) B₄H₆ can be prepared by reaction of BF₃ and NaBH₄

Ans. (2)

Sol.

B₄H₆ have 4 2c-2e bonds and 2 3c-2e bonds. Bridging bonds have larger bond length than terminal bonds. Angle between terminal bonds is more than angle between bridging bonds if all 4 terminal bonds are in one plane then bridging bonds are in perpendicular plane.

3NaBH₄ + 4BF₃ $\rightarrow$ 3NaBF₄ + 2B₂H₆
16. For a equilibrium reaction
   \[ A \rightleftharpoons B + \frac{1}{2} C \]
   The correct relation between degree of dissociation, equilibrium pressure and equilibrium constant is:
   
   \[ \frac{3(\alpha)^2P^2}{(1-\alpha)(2+\alpha)^2} \quad \frac{\sqrt{2}(\alpha)P}{(1-\alpha)(2+\alpha)} \quad \frac{\sqrt{2}(\alpha)P^2}{2(1-\alpha)(2+\alpha)} \quad \frac{2\alpha P}{(1-\alpha)(2+\alpha)} \]
   
   Ans. (1)

17. For a 1st order reaction following graph is obtained between \( \ln k \) and \( \frac{1000}{T} \). Then activation energy of reaction in kcal is:

   \[ \text{Slope} = -18.5 \]

   Ans. (37)

Sol. \[ k = A e^{-\frac{E_a}{RT}} \]

\[ \ln k = \ln A - \frac{E_a}{RT} \]

\[ \ln k = \ln A - \frac{1000}{10000} \frac{1000}{T} \]

Slope = \[ -\frac{E_a}{1000} = -18.5 \]
18. The difference between oxidation state of chromium in chromate & dichromate is –

An. (0)

Sol.

\[ \text{Chromate} \Rightarrow \text{CrO}_4^{2-} \]

\[ \text{Dichromate} \Rightarrow \text{Cr}_2\text{O}_7^{2-} \]

19. Which of the following is not a broad spectrum antibiotic

(1) Penicillin G (2) Cefoxitin (3) Amoxicillin (4) Chloramphenicol

An. (1)

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20.

[Diagram of a chemical reaction involving OMe, NaCN, and Br- ions]

An. (1)

Sol.

[Diagram of a chemical reaction involving OMe, NaCN, and Br- ions]

21. \( \text{CaH}_2 \xrightarrow{\text{HNO}_3} \text{A} \xrightarrow{\text{Br}_2} \text{B} \xrightarrow{\text{HCl}} \text{C} \)

What is major product C?

(1) \( \text{NO}_2 \text{C} = \text{CH}_2 \) (2) \( \text{CH} = \text{CH}_2 \)

(3) \( \text{NO}_2 \text{C} = \text{CH}_2 \) (4) \( \text{CH} = \text{CH}_2 \)

An. (2)
22. Which of the following will form polyester
   (1) β-Hydroxy butyric acid & β-hydroxy pentanoic acid
   (2) Butadiene & styrene
   (3) Neoprene
   (4) Melamine formaldehyde

   Ans. (1)

   Sol. Poly β-hydroxybutyrate-co-β-hydroxy valerate (PHBV) is obtained by the copolymerisation of 3-hydroxybutyric acid and 3-hydroxy pentanoic acid.

   ![Chemical structure of PHBV](attachment:image.png)

   PHBV is used in specialty packaging, orthopaedic devices and in controlled release of drugs. PHBV undergoes bacterial degradation in the environment.

23. Compound 'A' hydrolysis gives compound 'B' which on reaction with Br₂ water to form gluconic acid. 'A' originally has β-glycosidic linkages. Which of the following is compound A?
   (1) Starch
   (2) Cellulose
   (3) Amylose
   (4) Amylopectin

   Ans. (2)

   Sol. Cellulose, \((\text{C}_6\text{H}_{10}\text{O}_5)_n\)

   ![Cellulose structure](attachment:image.png)

   1,4-Glycosidic linkage of β-D-Glucose

   ![D-Glucose structure](attachment:image.png)

   Specific rotation (+52.7°)
24. 2, 7 Dimethyl 2,6 Octadiene

Number of sp² carbon present in product:

Ans. (2)

Sol.

25. Which of the following is conjugated diketone

Ans. (3)