12th Chemistry Book Back Questions - New Book

1.METALLURGY

I. Choose the Correct Answer

1. Bauxite has the composition
   a) Al_2O_3 b) **$Al_2O_3.nH_2O$**
   c) $Fe_2O_3.2H_2O$ d)None of these
2. Roasting of sulphide ore gives the gas (A).(A) is a colourless gas. Aqueous solution of (A) is acidic. The gas (A) is
   a) CO_2 b) SO_3 c) **SO_2** d) H_2S
3. Which one of the following reaction represents calcinations?
   a) $2Zn + O_2 \Rightarrow 2ZnO$ b) $2ZnS + 3O_2 \Rightarrow 2ZnO + 2SO_2$
   c) **$MgCO_3 \Rightarrow MgO + CO_2$** d) Both (a) and (c)
4. The metal oxide which cannot be reduced to metal by carbon is
   a) PbO b) **Al_2O_3** c) ZnO d) FeO
5. Which of the metal is extracted by Hall-Heroult process?
   a) **Al** b) Ni c) Cu d) Zn
6. Which of the following statements, about the advantage of roasting of sulphide ore before reduction is not true?
   a) ΔG_f^o of sulphide is greater than those for CS_2 and H_2S.
   b) ΔGr^o is negative for roasting of sulphide ore to oxide
   c) Roasting of the sulphide to its oxide is thermodynamically feasible.
   d) **Carbon and hydrogen are suitable reducing agents for metal sulphides.**
7. Match items in column - I with the items of column – II and assign the correct code.

Column-I		Column-II	
A	Cyanide process	i.	Ultrapure Ge
B	Froth floatation process	ii.	Dressing of ZnS
C	Electrolytic reduction	iii.	Extraction of Al
D	Zone refining	iv.	Extraction of Au
		v.	Purification of Ni

	A	B	C	D
(a)	(i)	(ii)	(iii)	(iv)
(b)	(iii)	(iv)	(v)	(i)
(c)	**(iv)**	**(ii)**	**(iii)**	**(i)**
(d)	(ii)	(iii)	(i)	(v)

9. Wolframite ore is separated from tinstone by the process of
   a) Smelting b) Calcination
   c) Roasting d) **Electromagnetic separation**
10. Which one of the following is not feasible
    a) $Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$

b) **$Cu(s) + Zn^{2+}(aq) \rightarrow Zn(s) + Cu^{2+}(aq)$**
c) $Cu(s) + 2Ag^{+}(aq) \rightarrow Ag(s) + Cu^{2+}(aq)$
d) $Fe(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Fe^{2+}(aq)$

11. Electrochemical process is used to extract
a) Iron b) Lead
c) **Sodium** d) silver

12. Flux is a substance which is used to convert
a) Mineral into silicate b) **Infusible impurities to soluble impurities**
c) Soluble impurities to infusible impurities d) All of these

13. Which one of the following ores is best concentrated by froth – floatation method?
a) Magnetite b) Hematite
c) **Galena** d) Cassiterite

14. In the extraction of aluminium from alumina by electrolysis, cryolite is added to
a) **Lower the melting point of alumina** b) Remove impurities from alumina
c) Decrease the electrical conductivity d) Increase the rate of reduction

15. Zinc is obtained from ZnO by
a) **Carbon reduction** b) Reduction using silver
c) Electrochemical process d) Acid leaching

16. Cupellation is a process used for the refining of
a) **Silver** b) Lead
c) Copper d) iron

17. Extraction of gold and silver involves leaching with cyanide ion. silver is later recovered by
a) Distillation b) Zone refining
c) **Displacement with zinc** d) liquation

18. Considering Ellingham diagram, which of the following metals can be used to reduce alumina?
a) Fe b) Cu c) **Mg** d) Zn

19. The following set of reactions are used in refining Zirconium

$$Zr\ (impure) + 2I_2 \xrightarrow{523\ K} ZrI_4$$
$$ZrI_4 \xrightarrow{1800K} Zr\ (pure) + 2I_2$$

This method is known as
a) Liquation b) **van Arkel process**
c) Zone refining d) Mond's process

20. Which of the following is used for concentrating ore in metallurgy?
a) Leaching b) Roasting
c) Froth floatation d) **Both (a) and (c)**

21. The incorrect statement among the following is
a) Nickel is refined by Mond's process
b) Titanium is refined by Van Arkel's process
c) Zinc blende is concentrated by froth floatation
d) **In the metallurgy of gold, the metal is leached with dilute sodium chloride solution**

22. In the electrolytic refining of copper, which one of the following is used as anode?
a) Pure copper b) **Impure copper**
c) Carbon rod d) Platinum electrode

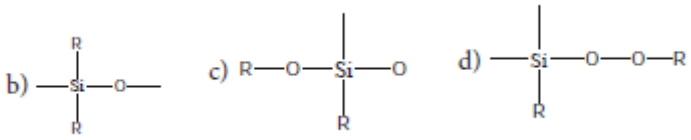
23. Which of the following plot gives Ellingham diagram
    a) ΔS Vs T b) **Δ G^o Vs T**
    c) ΔG Vs 1/ T d) ΔG^o Vs T^2
24. In the Ellingham diagram, for the formation of carbon monoxide **ANSWER: C**
    a) $\left(\frac{\Delta S^0}{\Delta T}\right)$ is negative b) $\left(\frac{\Delta G^0}{\Delta T}\right)$ is positive
    c) $\left(\frac{\Delta G^0}{\Delta T}\right)$ is negative d) initially $\left(\frac{\Delta T}{\Delta G^0}\right)$ is positive, after 700°C, $\left(\frac{\Delta G^0}{\Delta T}\right)$ is negative
25. Which of the following reduction is not thermodynamically feasible?
    a) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$ b) **$Al_2O_3 + 2Cr \rightarrow Cr_2O_3 + 2Al$**
    c) $3TiO_2 + 4Al \rightarrow 2Al_2O_3 + 3Ti$ d) none of these
26. Which of the following is not true with respect to Ellingham diagram?
    a) Free energy changes follow a straight line. Deviation occurs when there is a phase change.
    b) **The graph for the formation of CO_2 is a straight line almost parallel to free energy axis.**
    c) Negative slope of CO shows that it becomes more stable with increase in temperature.
    d) Positive slope of metal oxides shows that their stabilities decrease with increase in temperature.

2. p-BLOCK ELEMENTS-I

I. Choose the correct answer

1. An aqueous solution of borax is
    a) neutral b) acidic c) **basic** d) amphoteric
2. Boric acid is an acid because its molecule (NEET)
    a) contains replaceable H^+ ion b) gives up a proton
    c) combines with proton to form water molecule d) **accepts OH^- from water ,releasing proton.**
3. Which among the following is not a borane?
    a)B_2H_6 b)B_3H_6 c)B_4H_{10} d) none of these
4. Which of the following metals has the largest abundance in the earth's crust?
    a) Aluminium b) **calcium**
    c) Magnesium d) sodium
5. In diborane, the number of electrons that accounts for banana bonds is
    a) **six** b) two
    c) four d) three
6. The element that does not show catenation among the following p-block elements is
    a) Carbon b) silicon
    c) **Lead** d) germanium
7. Carbon atoms in fullerene with formula C_{60} have
    a) sp^3 hybridised b) sp hybridised
    c) **sp^2 hybridised** d) partially sp^2 and partially sp^3 hybridised
8. Oxidation state of carbon in its hydrides
    a) **+4** b) -4 c) +3 d) +2
9. The basic structural unit of silicates is
    a) $(SiO_3)^{2-}$ b) $(SiO_4)^{2-}$
    c) $(SiO)^-$ d) **$(SiO4)^{4-}$**

10. The repeating unit in silicone is v **ANSWER: B**



a) SiO_2

11. Which of these is not a monomer for a high molecular mass silicone polymer?
    a) **Me_3SiCl** b) $PhSiCl_3$ c) $MeSiCl_3$ d) Me_2SiCl_2
12. Which of the following is not sp^2 hybridised?
    a) Graphite b) graphene c) Fullerene d) **dry ice**
13. The geometry at which carbon atom in diamond are bonded to each other is
    a) **Tetrahedral** b) hexagonal
    c) Octahedral d) none of these
14. Which of the following statements is not correct?
    a) Beryl is a cyclic silicate b) Mg_2SiO_4 is an orthosilicate
    c) SiO_4^{4-} is the basic structural unit of silicates d) **Feldspar is not aluminosilicate**
15. AlF_3 is soluble in HF only in the presence of KF. It is due to the formation of (NEET)
    a) $K_3[AlF_3H_3]$ b) **$K_3[AlF_6]$**
    c) AlH_3 d) $K[AlF_3H]$
16. Match items in column - I with the items of column – II and assign the correct code.

Column-I		Column-II	
A	Borazole	1	$B(OH)_3$
B	Boric acid	2	$B_3N_3H_6$
C	Quartz	3	$Na_2[B_4O_5(OH)_4]\ 8H_2O$
D	Borax	4	SiO_2

	A	B	C	D
(a)	**2**	**1**	**4**	**3**
(b)	1	2	4	3
(c)	1	2	4	3
(d)	None of these			

17. Duralumin is an alloy of
    a) Cu,Mn b) Cu,Al,Mg c) Al,Mn d) **Al,Cu,Mn,Mg**
18. Thermodynamically the most stable form of carbon is
    a) Diamond b) **graphite** c) Fullerene d) none of these
19. The compound that is used in nuclear reactors as protective shields and control rods is
    a) **Metal borides** b) metal oxides
    c) Metal carbonates d) metal carbide
20. The stability of +1 oxidation state increases in the sequence
    a) **Al < Ga < In < Tl** b) Tl < In < Ga < Al
    c) In < Tl < Ga < Al d) Ga< In < Al < Tl

I. Choose the correct answer:

1. In which of the following , NH_3 is not used?
   a) **Nessler's reagent**
   b) Reagent for the analysis of IV group basic radical
   c) Reagent for the analysis of III group basic radical
   d) Tollen's reagent
2. Which is true regarding nitrogen?
   a) least electronegative element
   b) has low ionisation enthalpy than oxygen
   c) d- orbitals available
   d) **ability to form pπ −pπ bonds with itself**
3. An element belongs to group 15 and 3 rd period of the periodic table, its electronic configuration would be
   a) $1s^2\ 2s^2\ 2p^4$ b) $1s^2\ 2s^2\ 2p^3$
   c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$ d) **$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$**
4. Solid (A) reacts with strong aqueous NaOH liberating a foul smelling gas (B) which spontaneously burn in air giving smoky rings. A and B are respectively
   a) P_4(red) and PH_3 b) **P_4(white) and PH_3**
   c) S_8 and H_2S d) P_4(white) and H_2S
5. In the brown ring test, brown colour of the ring is due to
   a) a mixture of NO and NO_2 b) **Nitroso ferrous sulphate**
   c) Ferrous nitrate d) Ferric nitrate
6. On hydrolysis, PCl_3 gives
   a) **H_3PO_3** b) PH_3 c) H_3PO4 d) $POCl_3$
7. P_4O_6 reacts with cold water to give
   a) **H_3PO_3** b) $H_4P_2O_7$ c) HPO_3 d) H_3PO_4
8. The basicity of pyrophosphorous acid ($H_4P_2O_5$) is
   a) 4 b) **2** c) 3 d) 5
9. The molarity of given orthophosphoric acid solution is 2M. its normality is
   a) **6N** b) 4N c) 2N d) none of these
10. Assertion : bond dissociation energy of fluorine is greater than chlorine gas
    Reason: chlorine has more electronic repulsion than fluorine
    a) Both assertion and reason are true and reason is the correct explanation of assertion.
    b) Both assertion and reason are true but reason is not the correct explanation of assertion.
    c) Assertion is true but reason is false.
    d) **Both assertion and reason are false.**
11. Among the following, which is the strongest oxidizing agent?
    a) Cl_2 b) **F_2** c) Br_2 d) I_2
12. The correct order of the thermal stability of hydrogen halide is
    a) HI > HBr > HCl > HF b) **HF > HCl > HBr > HI**
    c) HCl > HF > HBr > HI d) HI > HCl > HF > HBr
13. Which one of the following compounds is not formed?

a) $XeOF_4$ b) XeO_3 c) XeF_2 d) **NeF_2**

14. Most easily liquefiable gas is
    a) Ar b) Ne c) **He** d) Kr
15. XeF_6 on complete hydrolysis produces
    a) $XeOF_4$ b) XeO_2F_2 c) **XeO_3** d) XeO_2
16. On oxidation with iodine, sulphite ion is transformed to
    a) $S_4O_6^{2-}$ b) $S_2O_6^{2-}$ c) **SO_4^{2-}** d) SO_3^{2-}
17. Which of the following is strongest acid among all?
    a) **HI** b) HF
    c) HBr d) HCl
18. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?
    a) $Br_2 > I_2 > F_2 > Cl_2$ b) $F_2 > Cl_2 > Br_2 > I_2$
    c) $I_2 > Br_2 > Cl_2 > F_2$ d) **$Cl_2 > Br_2 > F_2 > I_2$**
19. Among the following the correct order of acidity is
    a) $HClO_2 < HClO < HClO_3 < HClO_4$ b) $HClO_4 < HClO_2 < HClO < HClO_3$
    c) $HClO_3 < HClO_4 < HClO_2 < HClO$ d) **$HClO < HClO_2 < HClO_3 < HClO_4$**
20. When copper is heated with conc HNO_3 it produces
    a) $Cu(NO_3)_2$, NO and NO_2 b) $Cu(NO_3)_2$ and N_2O
    c) **$Cu(NO_3)_2$ and NO_2** d) $Cu(NO_3)_2$ and NO

4.TRANSITION AND INNER TRANSITION ELEMENTS

I. Choose the correct answer

1. Sc (Z=21) is a transition element but Zinc (z=30) is not because
    a) both Sc^{3+} and Zn^{2+} ions are colourless and form white compounds.
    b) **incase of Sc, 3d orbital are partially filled but in Zn these are completely filled**
    c) last electron as assumed to be added to 4s level in case of zinc
    d) both Sc and Zn do not exhibit variable oxidation states
2. Which of the following d block element has half filled penultimate d sub shell as well as half filled valence sub shell?
    a) **Cr** b) Pd c) Pt d) none of these
3. Among the transition metals of 3d series, the one that has highest negative (M^{2+} / M) standard electrode potential is
    a) **Ti** b) Cu c) Mn d) Zn
4. Which one of the following ions has the same number of unpaired electrons as present in V^{3+} ?
    a) Ti^{3+} b) Fe^{3+} c) **Ni^{2+}** d) Cr^{3+}
5. The magnetic moment of Mn^{2+} ion is
    a) **5.92BM** b) 2.80BM c) 8.95BM d) 3.90BM
6. Which of the following compounds is colourless?
    a) Fe^3 b) **Ti^{4+}** c) Co^{2+} d) Ni^{2+}
7. The catalytic behaviour of transition metals and their compounds is ascribed mainly due to

a) their magnetic behavior b) their unfilled d orbitals
c) **their ability to adopt variable oxidation states** d) their chemical reactivity

8. The correct order of increasing oxidizing power in the series
a) **$VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$** b) $Cr_2O_7^{2-} < VO_2^+ < MnO_4^-$
c) $Cr_2O_7^{2-} < MnO_4^- < VO_2^+$ d) $MnO_4^- < Cr_2O_7^{2-} < VO_2^+$

9. The alloy of copper that contain Zinc is
a) Monel metal b) Bronze
c) bell metal d) **brass**

10. Which of the following does not give oxygen on heating?
a) $K_2Cr_2O_7$ b) **$(NH_4)_2Cr_2O_7$** c) $KClO_3$ d) $Zn(ClO_3)_2$

11. In acid medium, potassium permanganate oxidizes oxalic acid to
a) oxalate b) **Carbon dioxide**
c) acetate d) acetic acid

12. Which of the following statements is not true?
a) on passing H_2S, through acidified $K_2Cr_2O_7$ solution, a milky colour is observed.
b) **$Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis**
c) $K_2Cr_2O_7$ solution in acidic medium is orange in colour
d) $K_2Cr_2O_7$ solution becomes yellow on increasing the PH beyond 7

13. Permanganate ion changes to _____ in acidic medium
a) MnO_4^{2-} b) **Mn^{2+}** c) Mn^{3+} d) MnO_2

14. A white crystalline salt (A) react with dilute HCl to liberate a suffocating gas (B) and also forms a yellow precipitate . The gas (B) turns potassium dichromate acidified with dil H_2SO_4 to a green coloured solution(C). A,B and C are respectively
a) **Na_2SO_3 , SO_2 , $Cr_{2(}SO_4)_3$** b) $Na_2S_2O_3$, SO_2 , $Cr_{2(}SO_4)_3$
c) Na_2S , SO_2 , $Cr_{2(}SO_4)_3O$ d) Na_2SO_4 , SO_2 , $Cr_{2(}SO_4)_3$

15. MnO_4^- react with Br^- in alkaline P^H to give
a) **BrO_3^-, MnO_2** b) Br_2 , MnO_4^{2-}
c) Br_2 , MnO_2 d) BrO^- , MnO_4^{2-}

16. How many moles of I_2 are liberated when 1 mole of potassium dichromate react with potassium iodide?
a) 1 b) 2 c) **3** d) 4

17. The number of moles of acidified $KMnO_4$ required to oxidize 1 mole of ferrous oxalate(FeC_2O_4) is
a) 5 b) 3 c) **0.6** d) 1.5

18. When a brown compound of Mn (A) ids treated with HCl , it gives a gas (B) . The gas (B) taken in excess reacts with NH_3 to give an explosive compound (C). The compound A, B and C are
a) **MnO_2, Cl_2 , NCl_3** b) MnO_2, Cl_2 , NH_4Cl
c) Mn_3O_4 , Cl_2 , NCl_3 d) MnO_3 , Cl_2 , NCl_2

19. Which one of the following statements related to lanthanons is incorrect?
a) Europium shows +2 oxidation state.
b) The basicity decreases as the ionic radius decreases from Pr to Lu.
c) **All the lanthanons are much more reactive than aluminium.**

d) Ce^{4+} solutions are widely used as oxidising agents in volumetric analysis.

20. Which of the following lanthanoid ions is diamagnetic?
    a) Eu^{2+} b) **Yb^{2+}** c) Ce^{2+} d) Sm^{2+}
21. Which of the following oxidation states is most common among the lanthanoids?
    a) 4 b) 2 c) 5 d) **3**
22. Assertion : Ce^{4+} is used as an oxidizing agent in volumetric analysis.
    Reason: Ce^{4+} has the tendency of attaining +3 oxidation state.
    a) **Both assertion and reason are true and reason is the correct explanation of assertion.**
    b) Both assertion and reason are true but reason is not the correct explanation of assertion.
    c) Assertion is true but reason is false.
    d) Both assertion and reason are false.
23. The most common oxidation state of actinoids is
    a) +2 b) +3 c) **+4** d) +6
24. The actinoid elements which show the highest oxidation state of +7 are
    a) **Np, Pu,Am** b) U, Fm, Th
    c) U, Th, Md d) Es, No, Lr
25. Which one of the following is not correct?
    a) **$La(OH)_2$ is less basic than $Lu(OH)_3$**
    b) In lanthanoid series ionic radius of Ln^{3+} ions decreases
    c) La is actually an element of transition metal series rather than lanthanide series
    d) Atomic radii of Zr and Hf are same because of lanthanide contraction

5. COORDINATION CHEMISTRY

I. Choose the correct answer:

1. The sum of primary valance and secondary valance of the metal M in the complex $[M(en)_2(Ox)Cl_2]$ is L
    a) 3 b) 6 c) -3 d) **9**
2. An excess of silver nitrate is added to 100ml of a 0.01M solution of pentaaquachloridochromium(III)chloride. The number of moles of AgCl precipitated would be
    a) 0.02 b) **0.002** c) 0.01 d) 0.2
3. A complex has a molecular formula $MSO_4Cl.6H_2O$.The aqueous solution of it gives white precipitate with Barium chloride solution and no precipitate is obtained when it is treated with silver nitrate solution. If the secondary valence of the metal is six, which one of the following correctly represents the complex?
    a) $[M(H_2O)_4Cl]SO_4.2H_2O$ b) $[M(H_2O)_6]SO_4$
    c) **$[M(H_2O)_5Cl]SO_4.H_2O$** d) $[M(H_2O)_3Cl]SO_4.3H_2O$
4. Oxidation state of Iron and the charge on the ligand NO in $[Fe(H_2O)_5NO]SO_4$ are
    a) +2 and 0 respectively b) +3 and 0 respectively
    c) +3 and -1 respectively d) **+1 and +1 respectively**
5. As per IUPAC guidelines, the name of the complex $[Co(en)_2(ONO)Cl]Cl$ is
    a) chlorobisethylenediaminenitritocobalt(III) chloride

b) chloridobis(ethane-1,2-diamine)nitro k-Ocobaltate(III) chloride
c) chloridobis(ethane-1,2-diammine)nitrito k-Ocobalt(II) chloride
d) **chloridobis(ethane-1,2-diamine)nitro k-Ocobalt(III) chloride**

6. IUPAC name of the complex K_3 [Al $(C_2O_4)_3$] is
a) potassiumtrioxalatoaluminium(III) b) potassiumtrioxalatoaluminate(II)
c) potassiumtrisoxalatoaluminate(III) d) **potassiumtrioxalatoaluminate(III)**

7. A magnetic moment of 1.73BM will be shown by one among the following
a) $TiCl_4$ b) $[CoCl_6]^{4-}$ c) **[Cu $(NH_3)_4$]$^{2+}$** d) [Ni (CN_4)]$^{2-}$

8. Crystal field stabilization energy for high spin d^5 octahedral complex is
a) $-0.6\ \Delta_o$ b) **0** c) 2 $(P - \Delta_o)$ d) 2 $(P + \Delta_o)$

9. In which of the following coordination entities the magnitude of Δ_o will be maximum?
a) **[Co$(CN)_6$]$^{3-}$** b) $[Co(C_2O_4)_3]^{3-}$
c) [Co ($H_2O)_6]^{3+}$ d) $[Co(NH_3)_6]^{3+}$

10. Which one of the following will give a pair of enantiomorphs?
a) [Cr$(NH_3)_6$] [Co $(CN)_6$] b) **[Co$(en)_2Cl_2$]Cl**
c) [Pt $(NH_3)_4$] [$PtCl_4$] d) [Cr$(NH_3)_4$ Cl_2] NO_2

11. Which type of isomerism is exhibited by [Pt $(NH_3)_2$ Cl_2] ?
a) Coordination isomerism b) Linkage isomerism
c) Optical isomerism d) **Geometrical isomerism**

12. How many geometrical isomers are possible for <<EVA035.eps>>?
a) **3** b) 4 c) 0 d) 15

13. Which one of the following pairs represents linkage isomers?
a) [Cu$(NH_3)_4$] [$PtCl_4$] and [Pt$(NH_3)_4$] [$CuCl_4$]
b) [Co$(NH_3)_5$ (NO_3)] SO_4 and [Co$(NH_3)_5$ (ONO)]
c) **[Co$(NH_3)_4$ $(NCS)_2$] Cl and [Co$(NH_3)_4$ $(SCN)_2$] Cl**
d) both (b) and (c)

14. Which kind of isomerism is possible for a complex <<EVA039.eps>>?
a) **geometrical and ionization** b) geometrical and optical
c) optical and ionization d) geometrical only

15. Which one of the following complexes is not expected to exhibit isomerism?
a) [Ni$(NH_3)_4(H_2O)_2]^{2+}$ b) <<EVA041.eps>>
c) [Co$(NH_3)_5$ SO_4] Cl d) **[Fe$(en)_3]^{3+}$**

16. A complex in which the oxidation number of the metal is zero is
a) K_4[Fe(CN_6)] b) [Fe$(CN)_3$ $(NH_3)_3$]
c) **[Fe$(CN)_5$]** d) both (b) and (c)

17. Formula of tris(ethane-1,2-diamine)iron(II)phosphate
a) [Fe$(CH_3$ -CH$(NH_2)_2)_3$] $(PO_4)_3$
b) [Fe$(H_2N$-CH_2 –CH_2 –$NH_2)_3$] $(PO_4)_2$
c) [Fe$(H_2N$-CH_2 –CH_2 –$NH_2)_3$] $(PO_4)_2$

d) **$[Fe(H_2N\text{-}CH_2\text{ –}CH_2\text{ –}NH_2)_3]_3\ (PO_4)_2$**

18. Which of the following is paramagnetic in nature?
    a) $[Zn(NH_3)_4]^{2+}$ b) $[Co(NH_3)_6]^{3+}$
    c) **$[Ni(H_2O)_6]^{2+}$** d) $[Ni(CN)_4]^{2-}$
19. Fac-mer isomerism is shown by
    a) $[Co(en)_3]^{3+}$ b) $[Co(NH_3)_4\,(Cl)_2]^{+}$
    c) **$[Co(NH_3)_4\,(Cl)_3]$** d) $[Co(NH_3)_5\,Cl]\,SO_4$
20. Choose the correct statement.
    a) Square planar complexes are more stable than octahedral complexes
    b) The spin only magnetic moment of $[Cu(Cl)_4]^{2-}$ is 1.732 BM and it has square planar structure.
    c) Crystal field splitting energy (Δ_o) of $[FeF_6]^{4-}$ is higher than the (Δ_o) of $[Fe(CN)_6]^{4-}$
    d) **Crystal field stabilization energy of $[V(H_2O)_6]^{2+}$ is higher than the crystal field stabilization of $[Ti(H_2O)_6]^{2+}$**

6.Solid State

I. Choose the correct answer:

1. Graphite and diamond are
    a) Covalent and molecular crystals b) ionic and covalent crystals
    c) **both covalent crystals** d) both molecular crystals
2. An ionic compound A_xB_y crystallizes in fcc type crystal structure with B ions at the centre of each face and A ion occupying entre of the cube. the correct formula of A_xB_y is
    a) AB b) **AB_3** c) A_3B d) A_8B_6
3. The ratio of close packed atoms to tetrahedral hole in cubic packing is
    a) 1:1 b) **1:2** c) 2:1 d) 1:4
4. Solid CO_2 is an example of
    a) Covalent solid b) metallic solid
    c) **molecular solid** d) ionic solid
5. Assertion : monoclinic sulphur is an example of monoclinic crystal system
   Reason: for a monoclinic system, $a \neq b \neq c$ and $\alpha = \gamma = 90^o$,$\beta \neq 90^o$
    a) **Both assertion and reason are true and reason is the correct explanation of assertion.**
    b) Both assertion and reason are true but reason is not the correct explanation of assertion.
    c) Assertion is true but reason is false.
    d) Both assertion and reason are false.
6. In calcium fluoride, having the flurite structure the coordination number of Ca^{2+} ion and F^- Ion are
    a) 4 and 2 b) 6 and 6
    c) **8 and 4** d) 4 and 8
7. The number of unit cells in 8 gm of an element X (atomic mass 40) which crystallizes in bcc pattern is (NA is the Avogadro number)
    a) 6.023×10^{23} b) **6.023×10^{22}**
    c) 60.23×10^{23} d) $(6.023 \times 10^{23} / 8 \times 40)$
8. The number of carbon atoms per unit cell of diamond is
    a) **8** b) 6 c) 1 d) 4

9. In a solid atom M occupies ccp lattice and 1/3 of tetrahedral voids are occupied by atom N. find the formula of solid formed by M and N.
   a) MN b) M_3N c) MN_3 d) **M_3N_2**
10. The composition of a sample of wurtzite is $Fe_{0.93}\ O_{1.00}$ what % of Iron present in the form of Fe^{3+}?
   a) 16.05% b) **15.05%** c) 18.05% d) 17.05%
11. The ionic radii of A^+ and B^- are 0.98×10^{-10} m and 1.81×10^{-10}m. the coordination number of each ion in AB is
   a) 8 b) 2 c) **6** d) 4
12. CsCl has bcc arrangement, its unit cell edge length is 400pm, its inter atomic distance is
   a) 400 pm b) 800 pm
   c) √3 ×100 pm d) **(√3/2) X 400 pm**
13. A solid compound XY has NaCl structure. if the radius of the cation is 100pm , the radius of the anion will be
   a) **(100 / 0.414)** b) (0.732 / 100)
   c) 100 × 0.414 d) (0.414 / 100)
14. The vacant space in bcc lattice unit cell is
   a) 48% b) 23% c) **32%** d) 26%
15. The radius of an atom is 300pm, if it crystallizes in a face centered cubic lattice, the length oif the edge of the unit cell is
   a) 488.5pm b) **848.5pm** c) 884.5pm d) 484.5pm
16. The fraction of total volume occupied by the atoms in a simple cubic is
   a) $\frac{\pi}{4\sqrt{2}}$ b) $\frac{\pi}{6}$ c) $\frac{\pi}{4}$ d) $\frac{\pi}{3\sqrt{2}}$
17. The yellow colour in NaCl crystal is due to
   a) **excitation of electrons in F centers**
   b) reflection of light from Cl^- ion on the surface
   c) refraction of light from Na^+ ion
   d) all of the above
18. if 'a' stands for the edge length of the cubic system ; sc , bcc, and fcc. Then the ratio of radii of spheres in these systems will be respectively. **ANSWER: C**

   a) $\left(\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a\right)$ b) $\left(\sqrt{1}a : \sqrt{3}a : \sqrt{2}a\right)$
   c) $\left(\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a\right)$ d) $\left(\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a\right)$

19. if 'a' is the length of the side of the cube, the distance between the body centered atom and one corner atom in the cube will be **ANSWER: D**

   a) $\left(\frac{2}{\sqrt{3}}\right)a$ b) $\left(\frac{4}{\sqrt{3}}\right)a$
   c) $\left(\frac{\sqrt{3}}{4}\right)a$ d) $\left(\frac{\sqrt{3}}{2}\right)a$

20. Potassium has a bcc structure with nearest neighbor distance 4.52 A^o . its atomic weight is 39. its

density will be

a) **915 kg m^{-3}** b) 2142 kg m^{-3} c) 452 kg m^{-3} d) 390 kg m^{-3}

21. Schottky defect in a crystal is observed when

a) unequal number of anions and anions are missing from the lattice

b) **equal number of anions and anions are missing from the lattice**

c) an ion leaves its normal site and occupies an interstitial site

d) no ion is missing from its lattice.

22. The cation leaves its normal position in the crystal and moves to some interstitial position, the defect in the crystal is known as

a) Schottky defect b) F center

c) **Frenkel defect** d) non-stoichiometric defect

23. Assertion: due to Frenkel defect, density of the crystalline solid decreases.
Reason: in Frenkel defect cation and anion leaves the crystal.

a) Both assertion and reason are true and reason is the correct explanation of assertion.

b) Both assertion and reason are true but reason is not the correct explanation of assertion.

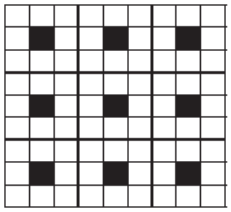
c) Assertion is true but reason is false.

d) **Both assertion and reason are false**

24. The crystal with a metal deficiency defect is

a) NaCl b) **FeO** c) ZnO d) KCl

25. A two dimensional solid pattern formed by two different atoms X and Y is shown below. The black and white squares represent atoms X and Y respectively. the simplest formula for the compound based



on the unit cell from the pattern is

a) **XY_8** b) X_4Y_9 c) XY_2 d) XY_4

7.CHEMICAL KINETICS

I. Choose the correct answer

1. For a first order reaction A ⟶ B the rate constant is x min^{-1} . If the initial concentration of A is 0.01M , the concentration of A after one hour isgiven by the expression.

a) 0.01 e^{-x} b) 1×10^{-2} $(1-e^{-60x})$

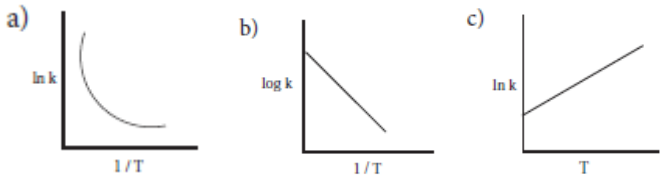
c) **$(1\times10^{-2})\ e^{-60x}$** d) none of these

2. A zero order reaction X ⟶ Product ,with an initial concentration 0.02M has a half life of 10 min. if one starts with concentration 0.04M, then the half life is

a) 10 s b) 5 min

c) **20 min** d) cannot be predicted using the given information

3. Among the following graphs showing variation of rate constant with temperature (T) for a reaction, the one that exhibits Arrhenius behavior over the entire temperature range is **ANSWER: B**



d) both (b) and (c)

4. For a first order reaction A ⟶ productnwith initial concentration x mol L^{-1} , has a half life period of 2.5 hours. For the same reaction with initial concentrationmol (x / 2) mol L^{-1} the half life is
   a) (2.5 × 2) hours
   b) (2.5 / 2) hours
   c) 2.5 hours
   d) **Without knowing the rate constant,$t_{1/2}$ cannot be determined from the given data**

5. For the reaction, $2NH_3 \longrightarrow N_2 + 3H_2$, if $\frac{-d[NH_3]}{dt} = k_1[NH_3], \frac{d[N_2]}{dt} = k_2[NH_3], \frac{d[H_2]}{dt} = k_3[NH_3]$ then the relation between k_1 ,k_2 and k_3 is
   a) $k_1 = k_2 = k_3$
   b) $k_1 = 3k_2 = 2k_3$
   c) **$1.5k_1 = 3k_2 = k_3$**
   d) $2k_1 = k_2 = 3k_3$

6. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first order reaction. It is because the
   a) rate is proportional to the surface coverage
   b) rate is inversely proportional to the surface coverage
   c) **rate is independent of the surface coverage**
   d) rate of decomposition is slow

7. For a reaction Rate = $k[acetone]^{3/2}$ then unit of rate constant and rate of reaction respectively is
   a) (mol $L^{-1}s^{-1}$) ($mol^{-1/2}$ $L^{1/2}$ s^{-1})
   b) **($mol^{-1/2}$ $L^{1/2}$ s^{-1}) (mol L^{-1} s^{-1})**
   c) ($mol^{1/2}$ $L^{1/2}$ s^{-1}) (mol L^{-1} s^{-1})
   d) (mol L s^{-1}) ($mol^{1/2}$ $L^{1/2}$ s)

8. The addition of a catalyst during a chemical reaction alters which of the following quantities?
   a) Enthalpy
   b) **Activation energy**
   c) Entropy
   d) Internal energy

9. Consider the following statements :
   (i) increase in concentration of the reactant increases the rate of a zero order reaction.
   (ii) rate constant k is equal to collision frequency A if $E_a = 0$
   (iii) rate constant k is equal to collision frequency A if E_a = °
   (iv) a plot of ln(k)vs T is a straight line.
   (v) a plot of ln(k)vs (1/T) is a straight line with a positive slope.

   Correct statements are
   a) **(ii) only**
   b) (ii) and (iv)
   c) (ii) and (v)
   d) (i), (ii) and (v)

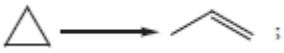
10. In a reversible reaction, the enthalpy change and the activation energy in the forward direction are respectively −x kJ mol^{-1} and y kJ mol^{-1}. Therefore , the energy of activation in the backward direction is
   a) (y −x) kJ mol^{-1}
   b) (x + y) J mol^{-1}
   c) (x −y) kJ mol^{-1}
   d) **(x + y) × 10^3 J mol^{-1}**

11. What is the activation energy for a reaction if its rate doubles when the temperature is raised from

200K to 400K? (R = 8.314 $JK^{-1}mol^{-1}$)

a) 234.65 kJ $mol^{-1}K^{-1}$ b) 434.65 kJ $mol^{-1}K^{-1}$

c) 434.65 J $mol^{-1}K^{-1}$ d) 334.65 J $mol^{-1}K^{-1}$

 This reaction follows first order kinetics. The rate constant at particular temperature is 2.303×10^{-2} $hour^{-1}$. The initial concentration of cyclopropane is 0.25 M. What will be the concentration of cyclopropane after 1806 minutes? (log 2 = 0.3010)

a) 0.125M b) 0.215M

c) **0.25×2.303M** d) 0.05M

12. For a first order reaction, the rate constant is 6.909 min^{-1}.the time taken for 75% conversion in minutes is

a) (3 / 2) log 2 b) **(2 / 3) log 2**

c) (3 / 2) log (3 / 4) d) (2 / 3) log (4 / 3)

13. In a first order reaction x ⟶ y ; if k is the rate constant and the initial concentration of the reactant x is 0.1M, then, the half life is

a) (log 2 / k) b) **(0.693 / (0.1) k)**

c) (ln 2 / k) d) none of these

14. Predict the rate law of the following reaction based on the data given below

$2A + B \longrightarrow C + 3D$

Reaction number	[A] (min)	[B] (min)	Initial rate ($M\ s^{-1}$)
1	0.1	0.1	x
2	0.2	0.1	2x
3	0.1	0.2	4x
4	0.2	0.2	8x

a) rate = k $[A]^2$ [B] b) rate = k [A] $[B]^2$

c) **rate = k[A][B]** d) rate = k $[A]^{1/2}$ $[B]^{3/2}$

15. Assertion: rate of reaction doubles when the concentration of the reactant is doubles if it is a first order reaction.

Reason: rate constant also doubles

a) Both assertion and reason are true and reason is the correct explanation of assertion.

b) **Both assertion and reason are true but reason is not the correct explanation of assertion.**

c) Assertion is true but reason is false.

d) Both assertion and reason are false.

16. The rate constant of a reaction is $5.8 \times 10{-}2\ s^{-1}$. The order of the reaction is

a) First order b) zero order

c) **Second order** d) Third order

17. For the reaction N_2O_5 (g) ⟶ $2NO_2$ (g) + 1/2 O_2 (g), the value of rate of disappearance of N_2O_5 is given as 6.5×10^{-2} mol $L^{-1}s^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as

a) **(3.25×10^{-2} mol $L^{-1}s^{-1}$) and (1.3×10^{-2} mol $L^{-1}s^{-1}$)**

b) (1.3×10^{-2} mol $L^{-1}s^{-1}$) and (3.25×10^{-2} mol $L^{-1}s^{-1}$)

c) (1.3×10^{-1} mol $L^{-1}s^{-1}$) and (3.25×10^{-2} mol $L^{-1}s^{-1}$)

d) None of these

18. During the decomposition of H_2O_2 to give dioxygen, 48 g O_2 is formed per minute at certain point of time. The rate of formation of water at this point is

a) 0.75 mol min^{-1} b) 1.5 mol min^{-1}

c) **2.25 mol min^{-1}** d) 3.0 mol min^{-1}

19. If the initial concentration of the reactant is doubled, the time for half reaction is also doubled. Then the order of the reaction is

a) Zero b) one

c) Fraction d) **none**

20. In a homogeneous reaction A ⟶ B + C + D, the initial pressure was P_o and after time t it was P. expression for rate constant in terms of P_o , P and t will be **ANSWER: A**

a) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_o}{3P_o - P}\right)$ b) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_o}{P_o - P}\right)$

c) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{3P_o - P}{2P_o}\right)$ d) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_o}{3P_o - 2P}\right)$

21. If 75% of a first order reaction was completed in 60 minutes , 50% of the same reaction under the same conditions would be completed in

a) **20 minutes** b) 30 minutes

c) 35 minutes d) 75 minutes

22. The half life period of a radioactive element is 140 days. After 560 days , 1 g of element will be reduced to

a) (1 / 2) g b) (1 / 4) g c) (1 / 8) g d) **(1 / 16) g**

23. The correct difference between first and second order reactions is that

a) A first order reaction can be catalysed; a second order reaction cannot be catalysed.

b) **The half life of a first order reaction does not depend on [A^o]; the half life of a second order reaction does depend on [A^o].**

c) The rate of a first order reaction does not depend on reactant concentrations; the rate of a second order reaction does depend on reactant concentrations.

d) The rate of a first order reaction does depend on reactant concentrations; the rate of a second order reaction does not depend on reactant concentrations.

24. After 2 hours, a radioactive substance becomes $(1/16)^{th}$ of original amount. Then the half life (in min) is

a) 60 minutes b) 120 minutes

c) **30 minutes** d) 15 minutes