GOVERNMENT OF TAMIL NADU

REDUCED PORTION
BOOK BACK QUESTIONS

HIGHER SECONDARY SECOND YEAR

CHEMISTRY

VOLUME - I

S.SHANMUGAM ,
ST.JOHN'S M.H.S.S
porur Chennai -116
Mob: 9841945665

UNIT 1 METALLURGY

EVALUATION

FEKC9Z

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) $2Zn + O_2 \longrightarrow 2ZnO$ b) $2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$

   c) $MgCO_3 \longrightarrow MgO + CO_2$ 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

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	B
(a)	(i)	(ii)	(iii)	(iv)
(b)	(iii)	(iv)	(v)	(i)
(c)	(iv)	(ii)	(iii)	(i)
(d)	(ii)	(iii)	(i)	(v)

8. Wolframite ore is separated from tinstone by the process of

a) Smelting
b) Calcination
c) Roasting
d) Electromagnetic separation

11. 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

12. Which one of the following ores is best concentrated by froth – floatation method?

a) Magnetite
b) Haematite
c) Galena
d) Cassiterite

14. Zinc is obtained from ZnO by

a) Carbon reduction
b) Reduction using silver
c) Electrochemical process
d) Acid leaching

15. Cupellation is a process used for the refining of

a) Silver
b) Lead
c) Copper
d) iron

16. Extraction of gold and silver involves leaching with cyanide ion. silver is later recovered by (NEET-2017)

a) Distillation
b) Zone refining
c) Displacement with zinc
d) liquation

18. 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

19. Which of the following is used for concentrating ore in metallurgy?

a) Leaching
b) Roasting
c) Froth floatation
d) Both (a) and (c)

20. 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

21. 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

Answer the following questions:

1. What are the differences between minerals and ores?
2. What are the various steps involved in extraction of pure metals from their ores?
4. Which type of ores can be concentrated by froth floatation method? Give two examples for such ores.
6. Describe a method for refining nickel.

11. Explain the following terms with suitable examples.

(i) Gangue (ii) slag

12. Give the basic requirement for vapour phase refining.

13. Describe the role of the following in the process mentioned.

(i) Silica in the extraction of copper.

(ii) Cryolite in the extraction of aluminium.

(iii) Iodine in the refining of Zirconium.

(iv) Sodium cyanide in froth floatation.

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

UNIT 2

p-BLOCK ELEMENTS-I

EVALUATION

XTYRAH

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.

4. Which of the following metals has the largest abundance in the earth's crust?

   a) Aluminium b) calcium c) Magnesium d) sodium

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

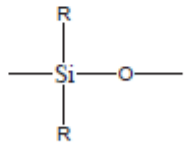
   c) sp^2 hybridised d) partially sp^2 and partially sp^3 hybridised

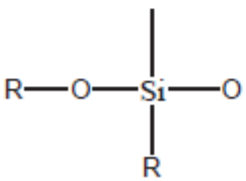
8. Oxidation state of carbon in its hydrides

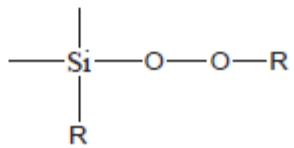
   a) +4 b) -4 c) +3 d) +2

10. The repeating unit in silicone is

    a) SiO_2

    b) 

    c) 

    d) 

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

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

Answer the following questions:

1. Write a short note on anamolous properties of the first element of p-block.
2. Describe briefly allotropism in p- block elements with specific reference to carbon.
4. Give the uses of Borax.
5. What is catenation ? describe briefly the catenation property of carbon.
8. Give the uses of silicones.

12. Give one example for each of the following

(i) icosogens (ii) tetragen (iii) prictogen (iv) chalcogen

13. Write a note on metallic nature of p-block elements.

14. Complete the following reactions

a. $B(OH)_3 + NH_3 \longrightarrow$

b. $Na_2B_4O_7 + H_2SO_4 + H_2O \longrightarrow$

e. $BF_3 + 9\ H_2O \longrightarrow$

f. $HCOOH + H_2SO_4 \longrightarrow$

g. $SiCl_4 + NH_3 \longrightarrow$

h. $SiCl_4 + C_2H_5OH \longrightarrow$

i. $B + NaOH \longrightarrow$

j. $H_2B_4O_7 \xrightarrow{\text{Red hot}}$

15. How will you identify borate radical?

17. How will you convert boric acid to boron nitride?

18. A hydride of 2nd period alkali metal (A) on reaction with compound of Boron (B) to give a reducing agent (C). identify A , B and C.

19. A double salt which contains fourth period alkali metal (A) on heating at 500K gives (B). aqueous solution of (B) gives white precipitate with $BaCl_2$ and gives a red colour compound with alizarin. Identify A and B.

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

UNIT 3

p-BLOCK ELEMENTS - II

EVALUATION

MM7FP9

Choose the best 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 $p\pi - p\pi$ 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

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

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? (NEET)

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) $Cl_2 > Br_2 > F_2 > I_2$

Answer the following questions:

1. What is inert pair effect?
2. Chalcogens belongs to p-block. Give reason.
3. Explain why fluorine always exhibit an oxidation state of -1?
4. Give the oxidation state of halogen in the following.

   a) OF_2 b) O_2F_2 c) Cl_2O_3 d) I_2O_4

5. What are interhalogen compounds? Give examples.
6. Why fluorine is more reactive than other halogens?
7. Give the uses of helium.
8. What is the hybridisation of iodine in IF_7? Give its structure.
9. Give the balanced equation for the reaction between chlorine with cold NaOH and hot NaOH.
10. How will you prepare chlorine in the laboratory?
15. Give the uses of argon.
16. Write the valence shell electronic configuration of group-15 elements.
20. Suggest a reason why HF is a weak acid, whereas binary acids of the all other halogens are strong acids.
22. What type of hybridisation occur in

    a) BrF_5 b) BrF_3

23. Write the reason for the anamolous behaviour of Nitrogen.

5. $P_4 + NaOH + H_2O \longrightarrow$
8. $KClO_3 \xrightarrow{\Delta}$
10. $Sb + Cl_2 \longrightarrow$
12. $XeF_6 + H_2O \longrightarrow$
13. $XeO_6^{4-} + Mn^{2+} + H^+ \longrightarrow$
14. $XeOF_4 + SiO_2 \longrightarrow$
15. $Xe + F_2 \xrightarrow[400^0C]{Ni\ /\ 200\ atm}$

UNIT 4

TRANSITION AND INNER TRANSITION ELEMENTS

EVALUATION

CFF541

Choose the best 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) in case 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 $\left(M^{2+}/M\right)$ 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 behaviour

   b) their unfilled d orbitals

   c) their ability to adopt variable oxidation states

   d) their chemical reactivity

9. The alloy of copper that contain Zinc is

   a) Monel metal b) Bronze

   c) bell metal d) brass

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) $La(OH)_3$ 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

Answer the following questions:

1. What are transition metals? Give four examples.
2. Explain the oxidation states of 4d series elements.
3. What are inner transition elements?
4. Justify the position of lanthanides and actinides in the periodic table.
5. What are actinides? Give three examples.
6. Why Gd^{3+} is colourless?
7. Explain why compounds of Cu^{2+} are coloured but those of Zn^{2+} are colourless.

9. What are interstitial compounds?
10. Calculate the number of unpaired electrons in Ti^{3+} , Mn^{2+} and calculate the spin only magnetic moment.
11. Write the electronic configuration of Ce^{4+} and Co^{2+}.
12. Explain briefly how +2 states becomes more and more stable in the first half of the first row transition elements with increasing atomic number.
13. Which is more stable? Fe^{3+} or Fe^{2+} - explain.
14. Explain the variation in $E^0_{M^{3+}/M^{2+}}$ 3d series.
15. Compare lanthanides and actinides.
17. Compare the ionization enthalpies of first series of the transition elements.
18. Actinoid contraction is greater from element to element than the lanthanoid contraction, why?
19. Out of $Lu(OH)_3$ and $La(OH)_3$ which is more basic and why?

20. Why europium (II) is more stable than Cerium (II)?

21. Why do zirconium and Hafnium exhibit similar properties?

23. The $E^0_{M^{2+}/M}$ value for copper is positive. Suggest a possible reason for this.

24. Describe the variable oxidation state of 3d series elements.

25. Which metal in the 3d series exhibits +1 oxidation state most frequently and why?

26. Why first ionization enthalpy of chromium is lower than that of zinc?

27. Transition metals show high melting points why?

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

UNIT 5 COORDINATION CHEMISTRY

EVALUATION

UUTJ41

Choose the correct answer:

1. The sum of primary valence and secondary valence of the metal M in the complex $\left[M(en)_2(Ox)\right]Cl$ is
   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) $\left[M(H_2O)_4Cl\right]SO_4.2H_2O$ b) $\left[M(H_2O)_6\right]SO_4$
   c) $\left[M(H_2O)_5Cl\right]SO_4.H_2O$ d) $\left[M(H_2O)_3Cl\right]SO_4.3H_2O$

4. Oxidation state of Iron and the charge on the ligand NO in $\left[Fe(H_2O)_5NO\right]SO_4$ 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 $\left[Co(en)_2(ONO)Cl\right]Cl$ is
   a) chlorobisethylenediaminenitritocobalt(III) chloride
   b) chloridobis(ethane-1,2-diamine)nitro κ-Ocobaltate(III) chloride
   c) chloridobis(ethane-1,2-diammine)nitrito κ-Ocobalt(II) chloride
   d) chloridobis(ethane-1,2-diammine)nitrito κ-Ocobalt(III)chloride

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

6. IUPAC name of the complex $K_3\left[Al(C_2O_4)_3\right]$ 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 (NEET)

a) $TiCl_4$ b) $[CoCl_6]^{4-}$

c) $\left[Cu(NH_3)_4\right]^{2+}$ d) $\left[Ni(CN)_4\right]^{2-}$

10. Which one of the following will give a pair of enantiomorphs?

a) $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$ b) $\left[Co(en)_2Cl_2\right]Cl$

c) $\left[Pt(NH_3)_4\right][PtCl_4]$ d) $\left[Co(NH_3)_4Cl_2\right]NO_2$

16. A complex in which the oxidation number of the metal is zero is

a) $K_4\left[Fe(CN)_6\right]$ b) $\left[Fe(CN)_3(NH_3)_3\right]$

c) $\left[Fe(CO)_5\right]$ d) both (b) and (c)

17. Formula of tris(ethane-1,2-diamine)iron(II)phosphate

a) $\left[Fe(CH_3\text{-}CH(NH_2)_2)_3\right](PO_4)_3$ b) $\left[Fe(H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2)_3\right](PO_4)$

c) $\left[Fe(H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2)_3\right](PO_4)_2$ d) $\left[Fe(H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2)_3\right]_3(PO_4)_2$

18. Which of the following is paramagnetic in nature?

a) $\left[Zn(NH_3)_4\right]^{2+}$ b) $\left[Co(NH_3)_6\right]^{3+}$

c) $\left[Ni(H_2O)_6\right]^{2+}$ d) $\left[Ni(CN)_4\right]^{2-}$

Answer the following questions:

1. Write the IUPAC names for the following complexes.

i) $Na_2\left[Ni(EDTA)\right]$

ii) $\left[Ag(CN)_2\right]^-$

iii) $\left[Co(en)_3\right]_2(SO_4)_3$

iv) $\left[Co(ONO)(NH_3)_5\right]^{2+}$

v) $\left[Pt(NH_3)_2Cl(NO_2)\right]$

2. Write the formula for the following coordination compounds.

   a) potassiumhexacyanidoferrate(II)

   b) pentacarbonyliron(0)

   c) pentaamminenitrito $-\kappa-N$ -cobalt(III)ion

   d) hexaamminecobalt(III)sulphate

   e) sodiumtetrafluoridodihydroxidochromate(III)

5. Based on VB theory explain why $\left[Cr(NH_3)_6\right]^{3+}$ is paramagnetic, while $\left[Ni(CN)_4\right]^{2-}$ is diamagnetic.

9. Give one test to differentiate $\left[Co(NH_3)_5Cl\right]SO_4$ and $\left[Co(NH_3)_5SO_4\right]Cl$.

12. Classify the following ligand based on the number of donor atoms.

    a) NH_3 b) en c) ox^{2-} d) pyridine

13. Give the difference between double salts and coordination compounds.

14. Write the postulates of Werner's theory.

22. What is the coordination entity formed when excess of liquid ammonia is added to an aqueous solution of copper sulphate?

23. On the basis of VB theory explain the nature of bonding in $\left[Co(C_2O_4)_3\right]^{3-}$.

24. What are the limitations of VB theory?

25. Write the oxidation state, coordination number , nature of ligand, magnetic property and electronic configuration in octahedral crystal field for the complex $K_4\left[Mn(CN)_6\right]$.

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

UNIT 6

SOLID STATE

EVALUATION

JN28IA

Choose the best 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 corners of the cube. the correct formula of AxBy is

   a) AB b) AB_3

   c) A_3B d) A_8B_6

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 $\alpha = \gamma = 90^0, \beta \neq 90^0$

   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.

7. The number of unit cells in 8 gm of an element X (atomic mass 40) which crystallizes in bcc pattern is (N_A is the Avogadro number)

a) 6.023×10^{23} b) 6.023×10^{22}

c) 60.23×10^{23} d) $\left(\frac{6.023\times10^{23}}{8\times40}\right)$

10. CsCl has bcc arrangement, its unit cell edge length is 400pm, its inter atomic distance is

a) 400pm b) 800pm c) $\sqrt{3}\times100$pm d) $\left(\frac{\sqrt{3}}{2}\right)\times400$pm

12. The vacant space in bcc lattice unit cell is

a) 48% b) 23% c) 32% d) 26%

14. The fraction of total volume occupied by the atoms in a simple cubic is

a) $\left(\frac{\pi}{4\sqrt{2}}\right)$ b) $\left(\frac{\pi}{6}\right)$ c) $\left(\frac{\pi}{4}\right)$ d) $\left(\frac{\pi}{3\sqrt{2}}\right)$

15. 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

16. 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.

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) $\left(\frac{1}{2}a:\sqrt{3}a:\frac{1}{\sqrt{2}}a\right)$

17. 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

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) $\left(\frac{\sqrt{3}}{2}\right)a$

18. Potassium has a bcc structure with nearest neighbor distance 4.52 A^0 . 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}

19. Schottky defect in a crystal is observed when

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

b) equal number of cations 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.

20. 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

21. 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

22. The crystal with a metal deficiency defect is

a) NaCl b) FeO

c) ZnO d) KCl

Answer the following questions:

1. Define unit cell.
2. Give any three characteristics of ionic crystals.
3. Differentiate crystalline solids and amorphous solids.
4. Classify the following solids
   a. P_4 b. Brass c. diamond d. NaCl e. Iodine
5. Explain briefly seven types of unit cell.

8. What are point defects?
9. Explain Schottky defect.

10. Write short note on metal excess and metal deficiency defect with an example.

11. Calculate the number of atoms in a fcc unit cell.

13. Why ionic crystals are hard and brittle?

14. Calculate the percentage efficiency of packing in case of body centered cubic crystal.

16. What is meant by the term "coordination number"? What is the coordination number of atoms in a bcc structure?

17. An element has bcc structure with a cell edge of 288 pm. the density of the element is 7.2 gcm^{-3}. how many atoms are present in 208g of the element.

19. if NaCl is doped with 10^{-2} mol percentage of strontium chloride, what is the concentration of cation vacancy?

20. KF crystallizes in fcc structure like sodium chloride. calculate the distance between K^+ and F^- in KF.(given : density of KF is 2.48 $g\ cm^{-3}$)

21. An atom crystallizes in fcc crystal lattice and has a density of 10 gcm^{-3} with unit cell edge length of 100pm. calculate the number of atoms present in 1 g of crystal.

22. Atoms X and Y form bcc crystalline structure. Atom X is present at the corners of the cube and Y is at the centre of the cube. What is the formula of the compound?

23. Sodium metal crystallizes in bcc structure with the edge length of the unit cell $4.3\times10^{-8}cm$. calculate the radius of sodium atom.

24. Write a note on Frenkel defect.

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

UNIT 7 CHEMICAL KINETICS

EVALUATION

9G9WX2

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

   a) $0.01\ e^{-x}$ b) $1\times10^{-2}\left(1-e^{-60x}\right)$

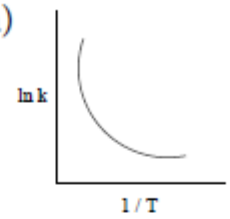
   c) $\left(1\times10^{-2}\right)e^{-60x}$ d) none of these

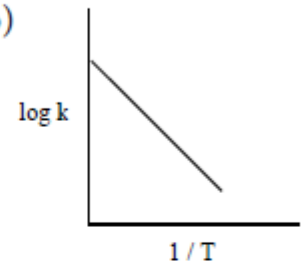
2. A zero order reaction $X \longrightarrow$ Product, with an initial concentration 0.02M has a half life of 10 min. if one starts with concentration 0.04M, then the half life is

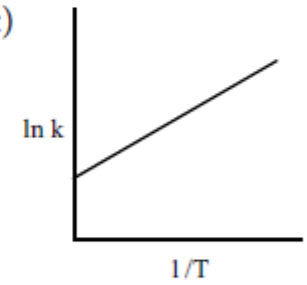
   a) 10 s b) 5 min c) 20 min

   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

   a)
   

   b)
   

   c)
   

   d) both (b) and (c)

4. For a first order reaction $A \longrightarrow$ product with initial concentration x mol L^{-1} , has a half life period of 2.5 hours. For the same reaction with initial concentration $\left(\frac{x}{2}\right)$ mol L^{-1} the half life is

a) (2.5×2) hours

b) $\left(\frac{2.5}{2}\right)$ 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) $k_1 = 3\,k_2 = 2\,k_3$

c) $1.5\,k_1 = 3\,k_2 = k_3$

d) $2k_1 = k_2 = 3\,k_3$

7. For a reaction Rate $= k[\text{acetone}]^{3/2}$ then unit of rate constant and rate of reaction respectively is

a) $(\text{mol L}^{-1}\text{s}^{-1}), (\text{mol}^{-1/2}\ \text{L}^{1/2}\ \text{s}^{-1})$

b) $(\text{mol}^{-1/2}\ \text{L}^{1/2}\ \text{s}^{-1}), (\text{mol L}^{-1}\text{s}^{-1})$

c) $(\text{mol}^{1/2}\ \text{L}^{1/2}\ \text{s}^{-1}), (\text{mol L}^{-1}\text{s}^{-1})$

d) $(\text{mol L s}^{-1}), (\text{mol}^{1/2}\ \text{L}^{1/2}\text{s})$

8. The addition of a catalyst during a chemical reaction alters which of the following quantities? (NEET)

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 $E_a = \infty$

(iv) a plot of $\ln(k)$ vs T is a straight line.

(v) a plot of $\ln(k)$ vs $\left(\frac{1}{T}\right)$ 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) $(x + y) \times 10^3$ J mol^{-1}

S.SHANMUGAM ,St.John's M.H.S.S porur Chennai -116 Mob: 9841945665

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}

b) 434.65 kJ mol^{-1}

c) 2.305 kJ mol^{-1}

d) 334.65 J mol^{-1}

12.  ; 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

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

a) $\left(\frac{3}{2}\right)\log 2$ b) $\left(\frac{2}{3}\right)\log 2$

c) $\left(\frac{3}{2}\right)\log\left(\frac{3}{4}\right)$ d) $\left(\frac{2}{3}\right)\log\left(\frac{4}{3}\right)$

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

a) $\left(\frac{\log 2}{k}\right)$ b) $\left(\frac{0.693}{(0.1)\,k}\right)$

c) $\left(\frac{\ln 2}{k}\right)$ d) none of these

15. 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) $\text{rate} = k[A]^2[B]$ b) $\text{rate} = k[A][B]^2$

c) $\text{rate} = k[A][B]$

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

16. 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.

17. 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

18. For the reaction $N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$, 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) $(3.25 \times 10^{-2}\ mol\ L^{-1}s^{-1})$ and $(1.3 \times 10^{-2}\ mol\ L^{-1}s^{-1})$

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

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

d) None of these

19. 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}

20. 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

21. In a homogeneous reaction $A \longrightarrow B + C + D$, the initial pressure was P_0 and after time t it was P. expression for rate constant in terms of P_0, P and t will be

a) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_0}{3P_0 - P}\right)$

b) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_0}{P_0 - P}\right)$

c) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{3P_0 - P}{2P_0}\right)$

d) $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_0}{3P_0 - 2P}\right)$

22. 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

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

a) $\left(\frac{1}{2}\right)g$ b) $\left(\frac{1}{4}\right)g$

c) $\left(\frac{1}{8}\right)g$ d) $\left(\frac{1}{16}\right)g$

24. The correct difference between first and second order reactions is that (NEET)

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 $[A_0]$; the half life of a second order reaction does depend on $[A_0]$.

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.

25. After 2 hours, a radioactive substance becomes $\left(\frac{1}{16}\right)^{th}$ of original amount.

Then the half life (in min) is

a) 60 minutes b) 120 minutes

c) 30 minutes d) 15 minutes

Answer the following questions:

1. Define average rate and instantaneous rate.
2. Define rate law and rate constant.
3. Derive integrated rate law for a zero order reaction $A \longrightarrow$ product .
4. Define half life of a reaction. Show that for a first order reaction half life is independent of initial concentration.
5. What is an elementary reaction? Give the differences between order and molecularity of a reaction.
6. Explain the rate determining step with an example.
7. Describe the graphical representation of first order reaction.
8. Write the rate law for the following reactions.
   (a) A reaction that is 3/2 order in x and zero order in y.
   (b) A reaction that is second order in NO and first order in Br_2.
10. The rate law for a reaction of A, B and C has been found to be $\text{rate} = k[A]^2[B][L]^{3/2}$. How would the rate of reaction change when
    (i) Concentration of [L] is quadrupled
    (ii) Concentration of both [A] and [B] are doubled
    (iii) Concentration of [A] is halved
    (iv) Concentration of [A] is reduced to $\left(\frac{1}{3}\right)$ and concentration of [L] is quadrupled.
11. The rate of formation of a dimer in a second order reaction is 7.5×10^{-3} mol $L^{-1}s^{-1}$ at 0.05 mol L^{-1} monomer concentration. Calculate the rate constant.
12. For a reaction $x + y + z \longrightarrow$ products the rate law is given by $\text{rate} = k[x]^{3/2}[y]^{1/2}$ what is the overall order of the reaction and what is the order of the reaction with respect to z.
14. Write Arrhenius equation and explains the terms involved.
15. The decomposition of Cl_2O_7 at 500K in the gas phase to Cl_2 and O_2 is a first order reaction. After 1 minute at 500K, the pressure of Cl_2O_7 falls from 0.08 to 0.04 atm. Calculate the rate constant in s^{-1}.
16. Give two exapmles for zero order reaction
17. Explain pseudo first order reaction with an example.
18. Identify the order for the following reactions

(i) Rusting of Iron

(ii) Radioactive disintegration of $_{92}U^{238}$

(iii) $2A + 3B \longrightarrow$ products ; $\text{rate} = k[A]^{1/2}[B]^2$

19. A gas phase reaction has energy of activation 200 kJ mol^{-1}. If the frequency factor of the reaction is 1.6×10^{13} s^{-1} . Calculate the rate constant at 600 K. $\left(e^{-40.09} = 3.8 \times 10^{-18}\right)$

20. For the reaction $2x + y \longrightarrow L$ find the rate law from the following data.

[x] (M)	[y] (M)	rate ($M\ s^{-1}$)
0.2	0.02	0.15
0.4	0.02	0.30
0.4	0.08	1.20

23. The rate constant for a first order reaction is $1.54 \times 10^{-3}\ s^{-1}$. Calculate its half life time.
24. The half life of the homogeneous gaseous reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$ which obeys first order kinetics is 8.0 minutes. How long will it take for the concentration of SO_2Cl_2 to be reduced to 1% of the initial value?
25. The time for half change in a first order decomposition of a substance A is 60 seconds. Calculate the rate constant. How much of A will be left after 180 seconds?
26. A zero order reaction is 20% complete in 20 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete?
27. The activation energy of a reaction is 22.5 k Cal mol^{-1} and the value of rate constant at 40°C is $1.8 \times 10^{-5}\ s^{-1}$. Calculate the frequency factor, A.
28. Benzene diazonium chloride in aqueous solution decomposes according to the equation $C_6H_5N_2Cl \longrightarrow C_6H_5Cl + N_2$. Starting with an initial concentration of 10 g L^{-1}, the volume of N_2 gas obtained at 50 °C at different intervals of time was found to be as under:

t (min):	6	12	18	24	30	∞
Vol. of N_2 (ml):	19.3	32.6	41.3	46.5	50.4	58.3

Show that the above reaction follows the first order kinetics. What is the value of the rate constant?

29. From the following data, show that the decomposition of hydrogen peroxide is a reaction of the first order:

t (min)	0	10	20
V (ml)	46.1	29.8	19.3

Where *t* is the time in minutes and V is the volume of standard $KMnO_4$ solution required for titrating the same volume of the reaction mixture.

30. A first order reaction is 40% complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete?

S.SHANMUGAM ,
St.John's M.H.S.S porur
Chennai -116
9841945665