# RAMAKRISHNA MISSION VIDYAMANDIRA 

Belur Math, Howrah - 711202
ADMISSION TEST - 2023
CHEMISTRY
Date :15-07-2023
Full Marks : 50
Time: 11.00 a.m - 12.00 noon

## Instructions for the Candidate

Answer all the questions given below. Each question carries 2 marks.
Tick $(\checkmark)$ the most appropriate option on the OMR SHEET.
The tick must be very clear - if it is smudgy or not clear, no marks will be awarded.
Any rough work must be done in the supplied rough sheet(s).
Candidates must return the rough sheet(s) along with the OMR SHEET.

1. A real gas which obeys van der Waals equation will approach ideal behavior if
(a) $a$ is large, $b$ is small
(b) $a$ is small, $b$ is large
(c) $a$ and $b$ both are large
(d) $a$ and $b$ both are negligibly small.
2. At constant volume, for a fixed number of moles of a gas the pressure increases with rise of temperature due to
(a) Increase in average molecular speed
(b) Decreased rate of collisions amongst molecules
(c) Increase in molecular attraction
(d) Decrease in mean free path
3. For the following reaction, equilibrium constant $K_{p}$ changes with

$$
\mathrm{H}_{2}(\mathrm{~g})+\mathrm{I}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{HI}(\mathrm{~g})
$$

(a) Total pressure
(b) Catalyst
(c) The amount of $\mathrm{H}_{2}$ and $\mathrm{I}_{2}$ present
(d)Temperature
4. Spontaneous adsorption of a gas on solid surface
(a) is an exothermic process
(b) may be exothermic or endothermic.
(c) is an endothermic process.
(d) neither endo or exothermic as enthalpy does not change
5. The gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y and 1 M Z at $25^{\circ} \mathrm{C}$. If the order of the reduction potential is $\mathrm{Z}>\mathrm{Y}>\mathrm{X}$, then
(a) Y will oxidize X and not Z
(b) Y will oxidize Z and not X
(c) Y will oxidize both X and Z
(d) Y will reduce both X and Z
6. Half-life period of a radioactive element is 140 days. After 560 days, one gram of the element will reduce to
(a) $1 / 2 \mathrm{~g}$
(b) $1 / 4 \mathrm{~g}$
(c) $1 / 8 \mathrm{~g}$
(d) $1 / 16 \mathrm{~g}$
7. The overall order of the reaction corresponding to rate constant $\mathrm{k}=1.63 \times 10^{-4} \mathrm{~mol}^{-2} \mathrm{lit}^{2} \mathrm{~s}^{-1}$ is
(a) 1
(b) 2
(c) 3
(d) 0
8. Which is true for a cyclic process?
(a) q , w are zero, du may not be zero
(b) du is zero, but $\mathrm{q}, \mathrm{w}$ may not be zero
(c) $\mathrm{q}, \mathrm{w}$, du all are zero
(d) $q$,w, du all may not be zero
9. Correct mathematical form of the First Law of Thermodynamics is
(a) $\mathrm{du}=\mathrm{q}+\mathrm{w}$
(b) $d u=d q+d w$
(c) $u=d q+d w$
(d) $d u=w-q$
( $u$ : internal energy , q : heat withdrawn by system, w: work done on the system)
10. For a zero-order reaction $\mathrm{A} \rightarrow \mathrm{P}$, which of the following plot is right. ([A $]_{0}$ and $[\mathrm{A}]_{\mathrm{t}}$ are concentrations at $\mathrm{t}=0$ and $\mathrm{t}=\mathrm{t}$ time.)




11. Correct IUPAC name for the following molecule is :

(a) 4-Hydroxybutanoic acid
(b) Ketobutan-1,2-diol
(c) Butane-4-carboxylic acid
(d) 4-Carboxylic acid butanol
12. Which of the followings is not an example of electrophile?
(a) $\mathrm{BF}_{3}$
(b) $\mathrm{H}_{3} \mathrm{O}^{+}$
(c) $\mathrm{Cl}^{+}$
(d) $\mathrm{CH}_{3} \mathrm{CO}^{+}$
13. Predict the major product for the following reaction:

a)

b)

c)

d)

14. RMgX should not react with :
a) $\mathrm{CH}_{3} \mathrm{COCH}_{3}$
b) $\mathrm{CH}_{3} \mathrm{OCH}_{3}$
c) PhOH
d) $\mathrm{CH}_{3} \mathrm{NH}_{2}$
15. Which of the followings is known as Brady's reagent:
(a) 2,4-Dinitophenyl hydrazine
b) $\mathrm{Br}_{2}$ in water
(c) $\mathrm{Br}_{2} / \mathrm{NaOH}$ in water
d) Alkaline $\mathrm{KMnO}_{4}$
16. Identify the product ' P ' in the following reaction

a)

b)

c)

d)

17. Which of the following molecules is most acidic in nature :
a)

b)

c)

d)

18. If a solution of $\mathrm{pH}=2$ is mixed with an equal volume of a solution of $\mathrm{pH}=5$, the pH of the resulting solution will be -
a) 3.5
b) 2.3
c) 7.0
d) None of these
19. The dark purple colour of $\mathrm{KMnO}_{4}$ is due to
a) $\sigma \rightarrow \pi^{*}$ transition.
b) Charge transfer transition
c) d-d transition
d) Ligand field transition.
20. The expected spin-only magnetic moments for $\left[\mathrm{Fe}(\mathrm{CN})_{6}\right]^{4-}$ and $\left[\mathrm{FeF}_{6}\right]^{3-}$, respectively are -
a) 1.73 and 1.73 BM
b) 0.0 and 5.92 BM
c) 0.0 and 1.73 BM
d) 1.73 and 5.92 BM
21. The photoelectric work function of a metal is 2.0 eV , the threshold wavelength will be -
a) $3108 \AA$
b) $6216 \AA$
c) $12432 \AA$
d) $1554 \AA$
22. Molecular weight of $\mathrm{KMnO}_{4}$ is 158 gm . Equivalent weight of $\mathrm{KMnO}_{4}$ at pH 4 and 7, respectively-
a) 52.66 and 31.6 gm
b) 31.6 and 52.66 gm
c) 31.6 and 158 gm
d) 158 and 32.66 gm
23. If indium is added in small quantity of Ge metal, we get -
a) n- type semiconductor
b) p- type semiconductor
c) Rectifier
d) Insulator
24. The correct order of the $\mathrm{O}-\mathrm{O}$ bond length in $\mathrm{O}_{2}, \mathrm{H}_{2} \mathrm{O}_{2}$ and $\mathrm{O}_{3}$ is -
a) $\mathrm{O}_{3}>\mathrm{H}_{2} \mathrm{O}_{2}>\mathrm{O}_{2}$
b) $\mathrm{O}_{2}<\mathrm{O}_{3}<\mathrm{H}_{2} \mathrm{O}_{2}$
c) $\mathrm{H}_{2} \mathrm{O}_{2}<\mathrm{O}_{3}<\mathrm{O}_{2}$
d) $\mathrm{O}_{2}>\mathrm{H}_{2} \mathrm{O}_{2}>\mathrm{O}_{3}$
25. The correct order of hybridisation of the central atom in the following species $\mathrm{NH}_{3},\left[\mathrm{PtCl}_{4}\right]^{2-}, \mathrm{PCl}_{5}$ and $\mathrm{BCl}_{3}$ is -
a) $d s p^{2}, d s p^{3}, s p^{2}, s p^{3}$
b) $s p^{3}, d s p^{2}, d s p^{3}, s p^{2}$
c) $d s p^{2}, s p^{2}, s p^{3}, d s p^{3}$
d) $s p^{3}, s p^{2}, d s p^{3}, d s p^{2}$

