Provincial Department of Education,Northern Province

# Pilot Exam – October 2021

## Grade 13 (2021 Batch) Chemistry

**Chemistry-1** | **02** | **E** | **1** | **Time :- 2 Hours**

**Instructions**

- **Periodic Table is provided.**
- **This paper consists of 10 pages.**
- **Answer all the questions.**
- **Use of calculators is not allowed .**
- **Write your Index Number in the space provided in the Answer sheet .**
- **Follow the instructions given on the back of the answer sheet carefully.**
- **In each of the questions 1 to 50 pick one of the alternatives from (1),2),(3),(4),(5) Which is correct or most appropriate and mark your response on the answer Sheet with a cross (x) in accordance with the instructions given on the back of the answer sheet.**

**Universal gas constant R = 8.314 $JK^{-1}mol^{-1}$** **Panck's constant h = $6.626x10^{-34}$ Js**
**Avogadro constant $N_A = 6.022x10^{23} Mol^{-1}$** **Veocity of ight c = $3x10^{8}$ $ms^{-1}$**

1. Identify the correct statement regarding the atomic structure from the following
   1. Cathode tube experiment - Chadwick
   2. Positive rays experiment – J.J.Thompson
   3. Radio activity in some nuclei of atoms -Becqurel
   4. Alpha rays scattering experiment - Crooks
   5. Determination of the charge of electron - Goldstein

2. The number of electrons in Chromium (Cr-24) with the quantum numbers $\ell = 1$ and m = -1 are respctively

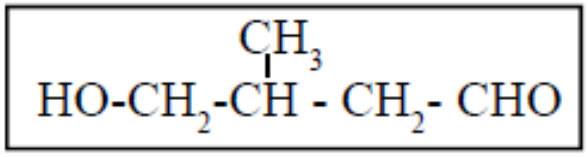
   1.3,8 2.2,2 3.2,6 4.2,4 5.2,12

3. M is an element that belongs to the second period in the periodic table. It forms a non polar covalent molecule $MCl_4$.The group of the periodic table to which M belongs is ;

   1. 2 2. 8 3. 6 4. 17 5. 14

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4. The IUPAC name of the given compound is,



1. 1-hydroxy-2-methylbutanal
2. 1-oxo-3-methylbutanol
3. 2-methyl-l-hydroxybutanol
4. 1-hydroxy-2-methylbutan-1-ol
5. 4-hydroxy-3-methylbutanal

5. The decresing order of radius of the species $Cl^-$,O,$O^{2-}$,F, $F^-$, $P^{3-}$

1. $P^{3-} > Cl^- > O^{2-} > F^- > O > F$
2. $P^{3-} > O^{2-} > Cl^- > F^- > O > F$
3. $Cl^- > P^{3-} > O^{2-} > F^- > O > F$
4. $Cl^- > P^{3-} > O^{2-} > O > F^- > F$
5. $O > F > F^- > O^{2-} > Cl^- > P^{3-}$

6. A rigid closed container contains Ideal gases A and B at 27°C with mole ratio of 2:3 .Their relative molecular masses are 32,28 respectively. When the pressure of the container was 2.5x10 $Nm^{-2.}$ Density of the container in $kg/m^3$ is,

1. 2 2. 3 3. 4 4. 5 5. 6

7. The number of electrons participated in the oxidation of ethanol ($CH_3$ CHO) to ethanoic acid ($CH_3$ COOH) using acidic $KMnO_4$ solution is ,

1. 2 2.3 3. 4 4. 5 5. 6

8. Consider the following equation

$$2SO_{2\,(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$$

The above reaction is spontaneous at 27°C, while non spontaneous at high temperature .Which of the following is correct related with $\Delta H$, $\Delta S$ and $\Delta G$ at 27°c is,

| | $\Delta H$ | $\Delta S$ | $\Delta G$ |
|---|---|---|---|
| 1. | (+) | (+) | (+) |
| 2. | (-) | (-) | (-) |
| 3. | (+) | (-) | (-) |
| 4. | (-) | (+) | (-) |
| 5. | (-) | (+) | (+) |

9. Which of the following set of cations form stable complex ions with ammonia solution

1. $Cu^{2+}$ , $Ag^+$ , $Pb^{2+}$
2. $Ni^{2+}$, $Co^{2+}$ $Fe^{2+}$
3. $Cu^{2+}$ , $Ag^+$ , $Mn^{2+}$
4. $Cu^{2+}$, $Ni^{2+}$, $Zn^{2+}$
5. $Ni^{2+}$, $Cu^{2+}$ , $Al^{3+}$

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10. 1.51 g of $KIO_3$ is dissolved in water and mixing with excess KI solution .Then $H_2SO_4$ was added to make 100 $cm^3$ solution. 25.00 $cm^3$ of the above solution was taken ,the liberated $I_2$ was titrated with $Na_2S_2O_3$ solution, using starch as an indicator . Burette reading was 20.00 $cm^3$. . The molarity of $Na_2S_2O_3$ solution is, (K=39, I=127, O=16)

1. 0.005 2. 0.05 3. 0.01 4. 0.02 5. 0.001

11. Which of the following is the correct pH of 0.1 mol/$dm^3$ $Na_2CO_3$ solution at $25^0$c ? 1st and 2nd ionization constants of $H_2CO_3$ is $1x10^{-7}$ mol/$dm^3$, $1x10^{-11}$ mol/ $dm^3$ respectively $k_w = 10^{-14}$ $mol^2/dm^6$.

1. 2 2. 1 3. 12 4. 10 5. 4

12. Which of the following statement is **false** regarding catalyst?

1. Catalyst doesn't show in intermediate and overall rate law
2. Catalyst used to increase the rate in one step and then it evolved in another step
3. In Multi step reaction catalyst cannot increase the rate of the last step
4. Catalyst increases the rate of a reaction
5. Catalyst involved in a chemical reaction

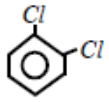
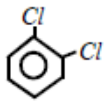
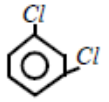
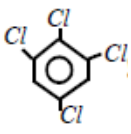
13. MX and NX are two sparingly soluble strong electrolytes.What is the concentrations of X in a saturated solution containing MX and NX in mol / $dm^3$ is, (Solubility product of MX, NX are $2x10^{-7}$ $mol^2/dm^6$, $5x10^{-8}$ $mol^2/dm^6$ respetively)

1. $2.5x10^{-7}$ 2. $5x10^{-4}$ 3. $3.5x10^{-4}$ 4. $2x10^{-7}$ 5. $3.5x10^{-7}$

14. Water and $CCl_4$ are two immisible liquids .An organic compound S dissolves in both solutions. S is more soluble in $CCl_4$ than water. The partition coefficient is 9. At equilibrium, concentration of S in water is 0.05 mol/$dm^3$ .What is the concentration of S in $CCl_4$ ? ( in mol/$dm^3$)

1. 0.05 2. 0.09 3. 0.45 4. 0.14 5. 0.005

15. Chlorine is more electronegative element.The correct product and mechanism for the chlorination reaction of chlorobenzene is,

1.  Nucleophilic addition
2.  Electrophilic addition
3.  Electrophilic substitution
4.  Nucleophilic Substitution
5.  Electrophilic addition

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16. Which one of the following is used to prepare Grignard Reagent

1. $HO - CH_2 - CH_2 - CH_2Br$
2. $CH_3 - \overset{\overset{O}{\|}}{C} - CH_2 - CH_2 Br$
3. $H - C \equiv C - CH_2 - CH_2 Br$
4. $CH_3 - \overset{\overset{H}{|}}{N} - CH_2 CH_2 Br$
5. $CH_3 - CH = CH - CH_2 Br$

**17.**

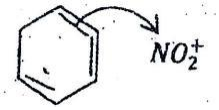
- The enthalpy change of sublimation of $Cu_{(S)}$ is 338 kJ $mol^{-1}$
- First and second ionization enthalpies of Cu (g) are 745 and 1960 kJ $mol^{-1}$
- Hydration enthalpy of $Cu^{2+}(g)$ is – 322 kJ $mol^{-1}$

The enthalpy change of the reaction $Cu^{2+}_{(aq)} + 2e \rightarrow Cu_{(S)}$ in kJ$mol^{-1}$ is,

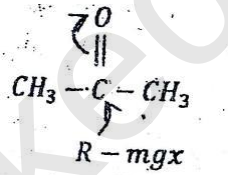
1. -2721 2. +2721 3. -2849 4. +2849 5. +958

18. Identify the **incorrect** meachanism from the following?

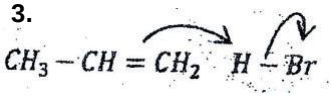
**1.**



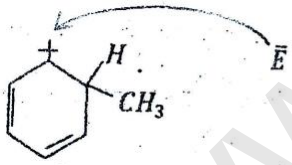

**2.**



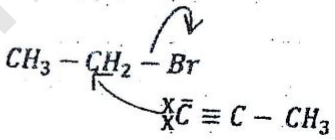

**3.**




**4.**




**5.**




19. Consider the following reaction

$$A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}$$

This is a single step reversible reaction.The activation energies for forward and backward reactions are 250 kJ$mol^{-1}$ and 170kJ$mol^{-1}$. When the presence of a particular catalyst, the activation energy reduced by 90kJ$mol^{-1}$ .The enthalpy change of the reaction with the presence of the catalyst is ,

1. – 30 kJ $mol^{-1}$
2. – 80 kJ $mol^{-1}$
3. + 80 kJ $mol^{-1}$
4. +190 kJ $mol^{-1}$
5. +30 kJ $mol^{-1}$

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20. The following statements are related to some industrial processes. The incorrect statement is,
    1. In the Ostwald process of $HNO_3$ preparation, $NH_3$ is calalytically oxidised to NO
    2. In $H_2SO_4$ preparation $SO_3$ is directly dissolved in water.
    3. Plant oil is used in the preparation of soap and bio diesel.
    4. Mg is manufactured from bittorn.
    5. In the membrane process of NaOH preparation, carbon is used as an anode and iron is used as cathode

21. Which of the following compound is not reduced by $H_2S$?
    1. $Br_2$ 2. HI 3. $FeCl_3$ 4. $KMnO_4$ 5. $K_2Cr_2O_7$

22. X is a soluble solid compound .An aqueous solution of X gives a white precipitate with dil $H_2SO_4$.. X doesn't give any colours in flame test. Aqueous solution of X gives ammonia gas when heated with NaOH and Al .The suitable compound for X is ,

    1. $Pb(NO_2)_2$ 2. $Pb(NO_3)_2$ 3. $PbBr_2$ 4. $Ba(NO_3)_2$ 5. $BaBr_2$

23. Identify the statements regarding d - block elements?
    1. Some of the d block elements form acidic oxides
    2. In Aqueous solution compounds of d - block elements never give colour
    3. Ions formed by d - block elements always contain incomplete d orbitals
    4. All the d - block elements behave as transition elements
    5. All the 1st series transition elements of the d - block elements conduct electricity

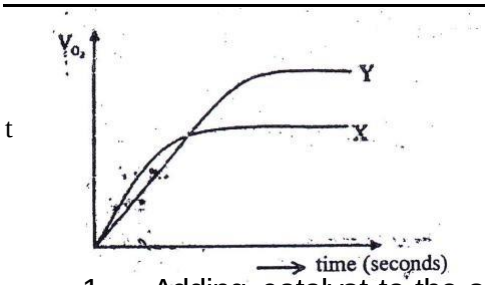
24. Which of the following answer gives the maximum pH, where $Ca(OH)_2$ precipitated in a 0.01 mol $dm^{-3}$ aqueous solution of $Ca^{2+}$ at 25°C (.At this temperature $K_{sp}$ of $Ca(OH)_2 = 4x\,10^{-6}$ mol $^3dm^{-9}$)

    1. 12.30 2. 11.23 3. 7.00 4. 10.60 5. 6.92

25. Which one is the three dimentional thermo setting polymer,
    1. Nylon 2. P.V.C. 3. Tefflon 4. Berklite 5. Vulganized rubber

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26. In this graph the line X shows the variation between volume of liberated $O_2$ ($Vo_2$) and the time of dissociation when 0.5 mol $dm^{-3}$ $H_2O_2$ dissociated . What is the suitable procedure to change the line X as line Y.




t

1. Adding catalyst to the system
2. Reducing the temperature of the system
3. Adding equal volume of 0.05 mol $dm^{-3}$ $H_2O_2$ solution
4. Adding catalyst and reduce the temperature
5. Adding equal volume of water to the system

27. Pure $CaCO_3$ was completely decomposed at $27^OC$ and $1x10^5$ $Nm^{-2}$ pressure. The volume of the liberated gas was 4.157 $dm^3$ . Assume that, the liberated gas behave as ideal, the mass of $CaCO_3$ sample in grams is, (Ca= 40, C=12, O = 16)

1. 1.67 2. 4.2 3. 8.4 4. 16.7 5. 33.3

28. Which of the following doesn't react with ammonia?

1. $Cl_2$ 2. Hg 3. Na 4. CuO 5. $FeCl_3$

29.Which one of the following is **incorrect** related to the industrial preparation of $Na_2CO_3$?

1. Brine solution is used as raw material.
2. Charcoal is used to get $CO_2$.
3. At first $NH_3$ and then CO were mixed.
4. Mixing of $CO_2$ in second tower is exothermic.
5. $NaHCO_3$ is obtained an the product. Then by heating it $Na_2CO_3$ is prepared.

30. Consider the following equation of a weak acid indicator .

$$HIn(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + In^-(aq)$$

The dissociation constant of the indicator $K_{In} = 1.0x10^{-10}$ mol $dm^{-3}$ and pH = 7 in aqueous solution.Which statement is correct regarding the above solution ,

1. $[In^-(aq)] < [HIn(aq)]$
2. $[In^-(aq)] = [HIn(aq)]$
3. $[In^-(aq)] > [HIn(aq)]$
4. $[In^-(aq)] = [H_3O^+(aq)]$
5. $[In^-(aq)] = [OH^-(aq)]$

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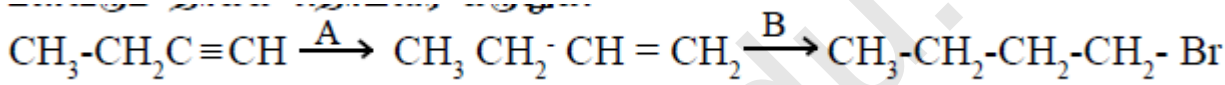
For each of the questions 31-40 ,one or more responses out of the four responses (a),(b),(c) and ,(d) given is/are correct ,select the correct response /responses .In

(1) If only (a) and (b) are correct
(2) If only (b) and (c) are correct
(3) If only (c) and (d) are correct
(4) If only (d) and (a) are correct
(5) If any other number or combinations of responses is correct.

Summary of above instructions

| (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|
| Only (a) and (b) are correct | Only (b) and (c) are correct | Only (c) and (d) are correct | Only (d) and (a) are correct | Any other number /combination of responses are correct |

31. Consider the following reaction scheme,



Suitable reagents for A and B are

a. Ni / $H_2$
b. Pd / $H_2$, quinoline,$BaSO_4$
c. HBr, $R_2O_2$
d. HBr

32. The products of the reaction between NaOH and $Cl_2$ are ,

a. NaOCl b. $NaClO_3$ c. $NaClO_4$ d. HCl

33. Which of the following/s is/are conjugate base for bronsted acids

a. HF b. $NH_3$ c. $HSO_4^-$ d. $HCO_3^-$

34. Which of the following solutions of salt/salts change the blue litmus paper to red

a. $CH_3NH_3Cl$ b. $CH_3COONa$ c. $CH_3COONH_4$ d. $NH_4Cl$

35. Chemical processes that occur in a series of steps.Which of the following statement/s is/are true regarding a first order reaction

a.Half life of 1st order reaction is given by the equation $t_{1/2}=0.693 / K$
b.The half life of a 1st order reaction is a constant and independent of the initial concentration of reactant
c.The half life of a zero order reaction is independent of initial concentration
d.The decomposition reaction of $H_2O_2$ is a zero order reaction

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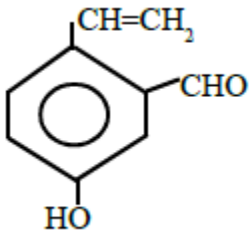
36. 0.02 moles of $O_2$, 0.01 moles $SO_2$, and 0.03 moles of $SO_3$ gases were inserted into a 1.0 $dm^3$ rigid closed container and allowed to reach equilibrium at 600K as given below.

$2SO_{2\,(g)} + O_{2(g)} \rightleftharpoons 2\,SO_{3(g)}$ $K_c = 2.4 \times 10^2\ dm^3 mol^{-1}$

Which of the following statement /s is/are correct for the change of the system from the initial stage to equilibrium. Qc is the reaction quotient.

a. Initially (Qc < Kc) equilibrium moves forward direction and the amound of $SO_3$ increases
b. Initially Qc> $K_c$ equilibrium moves backward direction and the amount of $SO_2$ increases
c. Initially Qc< $K_c$ equilibrium moves backward direction and the amount of $SO_2$ increases
d. Initially Qc<$K_c$ equilibrium moves forward direction and amount of $O_2$ decreases

37. Which statement/s is/are correct regarding the following compound




a. Gives silver mirror with $NH_3$ /$AgNO_3$
b. It liberates $CO_{2\,(g)}$ with $Na_2CO_3$
c. It gives brick red colour with Fehling solution
d. It decolourizes the colour of $Br_{2(aq)}$

38. $2H_2\,(g) + O_2(g) \rightarrow H_2O(g) \quad \Delta H_Q = -483.7\ kJ\ mol^{-1}$

Consider the above reaction. Which of the following statement/s are false regarding this reaction.

a. At standard condition, combustion of 1 mol $H_2$ (g) , 483.7kJ heat released.
b. At standard condition, 1 mol of water gas produced, 483.7kJ heat released
c. At standard condition, 2 mole of water gas produced, 483.7kJ heat released
d. At standard condition, 1 mole of oxygen reacted, entropy of the environment increases.

39. HX, and HY are two mono basic weak acids with concentration Cx and Cy ,dissociation constants Kx and Ky respectively .Which of the following statement/s is/are true in the equilibrium

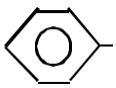
a) $[H^+_{(aq)}] = \sqrt{\frac{K_x C_x + K_y C_y}{2}}$

b) $[X^-_{(aq)}] = [Y^-_{(aq)}]$

c) $[X^-_{(aq)}] + [Y^-_{(aq)}] = \sqrt{K_x C_x + K_y C_y}$

d) $\frac{K_x}{K_y} = \frac{C_y [X^-_{(aq)}]}{C_x [Y^-_{(aq)}]}$

40. Which of the following/s reacted with water and give a gas

a. Al b.  $N_2Cl$ c. $CaC_2$ d. $F_2$

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In questions Numbers 41 to 50 two statements are given in respect of each question.From the table given below ,select the responses ,out of the responses (1), (2), (3), (4) and (5) best fits the two statements and mark appropriately on your answer sheet. .

| Response | First statement | Second statement |
|---|---|---|
| (1) | True | True,and correctly explains the first statement |
| (2) | True | True,but does not explain the first statement correctly |
| (3) | True | False |
| (4) | False | True |
| (5) | False | False |

| | First Statement | Second statement |
|---|---|---|
| 41 | Lattice energy found by indirect method is called Born Haber Cycle | Lattice energy of LiF is not found directly.It is calculated by indirect method. |
| 42 | Among the oxides of Cr and Mn , $CrO_3$ and $Mn_2O_7$ are acidic. | Acidic /basic nature of Cr and Mn oxides depends the oxidation number of metals. |
| 43 | An acidic buffer can be prepared by mixing a weak acid HA (aq) with NaOH(aq) | When $H^+(aq)$ or $OH^-(aq)$ was added to the buffer solution the added amount of $H^+(aq)$ or $OH^-(aq)$ ion removed by the following reactions. $OH^-(aq) + HA(aq) \rightarrow A^+(aq) + HO(l)$ $H^+(aq) + A^-(aq) \rightarrow HA(aq)$ |
| 44 | At a given temperature and pressure ,molar volume of two different gases are differ from each other | At 0 $^oC$ and 1 atm pressure the moar Volume of an ideal gas is 22.414 $dm^3\ mol^{-1}$. |
| 45 | Hydrogen bond consisting interactions exist in the mixture of water and ethanol. | The mixture of ethanol ,water is a negative deviation mixture. |
| 46 | $Fe^{2+}(aq)$ never gives a precipitate, when passing through $NH_4Cl_{(aq)}$ and $NH_4OH_{(aq)}$ aqueous solution. | $NH_4Cl_{(aq)}$ $NH_4OH_{(aq)}$ mixture behave as buffer. |
| 47 | Acidic strength of benzoic acid is greater than formic acid. | Activation property of H is greater than that of C6H5 |
| 48 | P+Q -----→ R is a first order reaction with respect to Reactant P, the graph ,rate against the concentration of P is a parabolic line passing through the origin. | Initial rate of a 1st order reaction is dependent of the concentration of reactant. |
| 49 | Reaction between ammonia and an alkyl halide gives a mixture of primary,secondary and tertiary amine and a quaternary ammonium salt. | primary,secondary and tertiary amines can react as electrophiles. |

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| | | |
|---|---|---|
| 50 | All the compounds with C=C bond shows diasteroisomerism. | Any mirror image containing any two isomers shows diasteroisomerism. |

