पुष्पना International School
Shree Swaminarayan Gurukul, Zundal

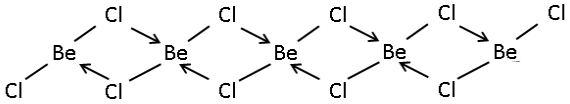
Annual Examination [2020 – 21]					
Student Name				**Grade**	**XI**
Date	**20/02/2021**			**Subject**	**CHEMISTRY**
Set - A		**Time**	**3Hr**	**Total Marks**	**70**

General Instructions:

1. **There are 33 questions in this question paper. All questions are compulsory.**
2. **Section A: Q. No. 1 to 16 are objective type questions. Q. No. 1 and 2 are passage based questions carrying 4 marks each while Q. No. 3 to 16 carry 1 mark each.**
3. **Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.**
4. **Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.**
5. **Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.**
6. **There is no overall choice. However, internal choices have been provided.**
7. **Use of calculators and log tables is not permitted.**

[Section A]

1. Read the following passage and answer the following questions:
The dipositive oxidation state (M^{2+}) is the predominant valence of Group 2 elements. The alkaline earth metals form compounds that are predominantly ionic but less ionic than the corresponding compounds of alkali metals. The oxides and other compounds of beryllium and magnesium are more covalent than those formed by the heavier and large-sized members (Ca, Sr, Ba). The nitrates are made by the dissolution of the carbonates in dilute nitric acid. Carbonates of alkaline earth metals are insoluble in water and can be precipitated by addition of a sodium or ammonium carbonate solution to a solution of a soluble salt of these metals. Except for beryllium halides, all other halides of alkaline earth metals are ionic in nature. Beryllium halides are essentially covalent and soluble in organic solvents. Beryllium chloride has a chain structure.



i. Beryllium hydroxide is _____ in nature.

a. amphoteric
b. basic
c. acidic
d. can be acidic and basic both

ii.Why Beryllium does not compare well with other members of the group?

a. small size
b. ionic sizes
c. both (a) and (b)
d. none of these

OR

iii. Which of the following crystallises as the anhydrous salt?

a. Barium nitrate
b. Magnisium nitrate
c. Aluminum nitrate
d. none of these

iv. The basic strength of which hydroxide is maximum

a. LiOH
b. NaOH
c. $Ca(OH)_2$
d. KOH

2. Read the passage given below and answer the following questions:

The presence of a positive charge on the nucleus is due to the protons in the nucleus. The number of electrons in an atom is equal to the number of protons (atomic number, Z). The positive charge of the nucleus is due to protons, the mass of the nucleus, due to protons and neutrons. The composition of any atom is represented by using the normal element symbol (X) with super-script on the left-hand side as the atomic mass number (A) and subscript (Z) on the left-hand side as the atomic number. Isotopes are the chemical properties of atoms that are controlled by the number of electrons, which are determined by the number of protons in the nucleus. Isobars are atoms with the same mass number but a different atomic number. Atoms with identical atomic number but a different atomic mass number are known as Isotopes. Number of neutrons present in the nucleus have very little effect on the chemical properties of an element.

In these questions, a statement of assertion followed by the statement of reason is given. Choose the correct answer out of the following choices:

a. Assertion and reason both are correct statements and reason is the correct explanation for assertion.
b. Assertion and reason both are correct statements and reason is not the correct explanation for assertion.
c. Assertion is the correct statement but reason is wrong statement.
d. Assertion is the wrong statement but reason is correct statement.

i. Assertion: Chlorine atoms contain 17 protons and 28 neutrons.
Reason: The total number of nucleons is termed as mass number (A) of the atom.

ii. Assertion: $_1H$, $_2H$, and $_3H$ are isotopes.
Reason: Atoms with identical atomic number but different atomic mass number are known as Isotopes.

iii. Assertion: The charge on the proton is equal but opposite to that of the electron.
Reason: The number of protons present in the nucleus is equal to the atomic number (Z).

iv. Assertion: Carbon atoms generally have 6, 7 and 8 neutrons besides 6 protons.
Reason: Number of electrons in the hydrogen atom and sodium atom are 2 and 13 respectively.

3. The mass of 1 molecule of O_2 is

a. 6.32×10^{-23}g
b. 5.32×10^{-23}g
c. 4.32×10^{-23}g
d. 7.32×10^{-23}g

4. The orbital with n = 3 and l = 2 is

a. 3p
b. 3d
c. 3s
d. 3f

OR

4. The number of radial nodes for 3p orbital is _____.

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

5. Ozonolysis of an organic compound gives formaldehyde as one of the products. This confirms the presence of:

a. a vinyl group
b. two ethylenic double bonds
c. an isopropyl group
d. an acetylenic triple bond

6. For the process to occur under adiabatic conditions, the correct condition is:

a. q = 0
b. $\triangle T = 0$
c. $\triangle p = 0$
d. w = 0

OR

6. According to the first law of thermodynamics $\Delta U = q + w$, here what is a sign of q and w?

a. q is negative if heat is transferred into the system and w is negative if work is done on the system.
b. q is positive if heat is transferred into the system and w is positive if work is done by the system.
c. q is negative if heat is transferred from the system and w is negative if work is done by the system.
d. q is positive if heat is transferred into the system and w is positive if work is done on the system.

7. The general electronic configuration of alkali metals is:

a. $1s^1 2s^1$
b. ns^2
c. ns^1
d. $1s^2$

8. The general electronic configuration of ns^2 exists in:

a. transition elements
b. alkali metals
c. alkaline earth metals
d. coordination compounds

9.The increasing order of reduction of alkyl halides with zinc and dilute HCl is

a. R–Cl < R–Br < R–I
b. R–I < R–Br < R–Cl
c. R–Br < R–I < R–Cl
d. R–Cl < R–I < R–Br

10. Arrange the following hydrogen halides in order of their decreasing reactivity with propene.

a. HCl > HBr > HI
b. HI > HBr > HCl
c. HCl > HI > HBr
d. HBr > HI > HCl

11. Based on VSEPR theory, the number of 90^0 F — Br — F angles in BrF_5 is:

a. 8 b. 2 c. 4 d. 0

12. Assertion: Vapour density of sulphur relative to oxygen is 2 because sulphur atom is twice as heavy as that of the oxygen atom.
Reason: Vapour density depends upon the molecular state of the substance in the vapour state.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is INCORRECT.
d. Assertion is INCORRECT but, reason is CORRECT.

13. Assertion: Glass is not an example of silicates.
Reason: All silicates have tetrahedral SiO_4^{4-} unit.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is
d. Assertion is INCORRECT but, reason is CORRECT.

14. Assertion (A): At critical temperature liquid passes into gaseous state imperceptibly and continuously.
Reason (R): The density of liquid and gaseous phase is equal to critical temperature.

a. Both A and R are true and R is the correct explanation of A.
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.

OR

14.Assertion: The root mean square velocity of an ideal gas at constant pressure varies with density as 1 √d.
Reason: Average kinetic energy of a gas is directly proportional to the absolute temperature.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is INCORRECT.
d. Assertion is INCORRECT but, reason is CORRECT.

15. Assertion: Oxidation number of C in HCHO is zero.
Reason: Formaldehyde is a covalent compound.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is INCORRECT.
d. Assertion is INCORRECT but, reason is CORRECT.

16. Assertion: Terminal alkynes on oxidation with Bayer's reagent give a mixture of carboxylic acid and CO_2.
Reason: Terminal alkynes show acidic character.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is INCORRECT.
d. Assertion is INCORRECT but, reason is CORRECT.

[Section B]

17. How do alkali and alkaline earth metals react with water?

OR

17. On the basis of quantum numbers, justify that the sixth period of the periodic table should have 32 elements.

18. Why is sp hybrid orbital more electronegative than sp^2 or sp^3 hybridized orbitals?

19. For the reaction, $NO(g) + O_3(g) \rightarrow NO_2(g) + O_2(g)$, $K_c = 6.3 \times 10^{14}$ at 1000 K. Both the forward and reverse reactions are elementary bimolecular reactions in equilibrium. What is K_c for the reverse reaction?

20. Classify the following reactions in one of the reaction type studied in this unit.
   a. $CH_3CH_2Br + Hs^- \rightarrow CH_3CH_2SH + Br^-$
   b. $(CH_3)_2C = CH_2 + HCl \rightarrow (CH_3)_2CCl - CH_3$
   c. $CH_3CH_2Br + HO^- \rightarrow CH_2 = CH_2 + H_2O + Br^-$
   d. $(CH_3)_3C\text{-}CH_2OH + HBr \rightarrow (CH_3)_2C\ Br\ CH_2CH_3 + H_2O$

21. Why does SO_3 act as an electrophile?

22. Do you expect the carbon hydride of type $(Cn\ H_{2n} + 2)$ to act as Lewis acid or base?

23. If same mass of liquid water and a piece of ice is taken, then why is the density of ice less than that of liquid water?

24. What do you understand by iso-electronic species? Name a species that will be iso-electronic with each of the following atoms or ions.

25. A flask was heated from 27°C to 227°C at constant pressure. Calculate the volume of the flask if a volume of air, measured at 227°C, was expelled from the flask.

[Section C]

26. The drain cleaner, Drainex contains small bits of aluminium which react with caustic soda to produce dihydrogen. What volume of dihydrogen at 20°C and one bar will be released when 0.15 g of aluminium reacts?

27. A flask P contains 0.5 mole of oxygen gas. Another flask Q contains 0.4 mole of ozone gas. Which of the two flasks contains greater number of oxygen atoms?

OR

27. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid given reaction,

$4HCl(aq) + MnO2(s) \rightarrow 2H2O(l) + MnCI_2(aq) + CI_2(g)$

Calculate how many gram of HCI reacts with 5.0 g of manganese dioxide?

28. The dipole moment of trans 1,2-dichloroethane is less than the cis – isomer. Explain.

29. What are allotropes? Sketch the structure of two allotropes of carbon namely diamond and graphite. What is the impact of structure on physical properties of two allotropes?

30. For the reaction, $2A(g) + B(g) \rightarrow 2D(g)$; $\Delta U^o = -10.5$ kJ and $\Delta S^o = -44.1$ JK^{-1}. Calculate ΔG° for the reaction and predict whether the reaction may occur spontaneously.
($R = 8.314 \times 10^{-3}$ kJ mol^{-1}, T = 298 K)

[Section D]

31. Write the Lewis structure of the nitrite ion, NO_2^-.

32. At 1127 K and 1 atmosphere pressure, a gaseous mixture of CO and CO_2 in equilibrium with solid carbon has 90.55% CO by mass.
$C(s)+CO_2(g) \rightarrow 2CO(g)$
Calculate K_c for the reaction at the above temperature.

OR

32. The value of $K_c = 4.24$ at 800K for the reaction, $CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$
Calculate equilibrium concentrations of CO_2, H_2, CO and H_2O at 800 K, if only CO and H_2O are present initially at concentrations of 0.10M each.

33. What are hybridisation states of each carbon atom in the following compounds?

a. $CH_2 = C = O$
b. $(CH_3)_2CO$
c. $CH_3 - CH_2$
d. C_6H_6
e. $CH_2 = CHCN$

OR

33. Explain the terms inductive and electromeric effects. Which electron displacement effect explain the following correct orders of acidity of the carboxylic acids?

i. $Cl_3CCOOH > Cl_2CHOOH > ClCH_2COOH$
ii. $CH_3CH_2COOH > (CH_3)_2CHOOH > (CH_3)_3C \cdot COOH$