



VANDANA INTERNATIONAL SCHOOL
HALF YEARLY EXAMINATION
SESSION 2024-25
CLASS: XI
SUBJECT: CHEMISTRY (043)
SET A

Tanvi
XI - A
42

TIME: 3 Hours

M.M. 70

GENERAL INSTRUCTIONS:

1. There are 33 questions in this question paper .
2. SECTION A consists of 16 questions carrying 1 mark each.
3. SECTION B consists of 5 short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks .
5. SECTION D consists of 2 case-based questions carrying 4 marks each
6. SECTION E consists of 3 long answer questions carrying 5 marks each
7. All questions are compulsory.

SECTION A

- Q1. Complete combustion of 1.80 g of an oxygen containing compound ($C_xH_yO_z$) gave 2.64 g of CO_2 and 1.08 g of H_2O . The percentage of oxygen in the organic compound is
a. 63.53 b. 51.63 c. 53.33 d. 50.33
- Q2. If the concentration of glucose in blood is 0.9 gL^{-1} , what will be the molarity of glucose in blood
a. 5M b. 50M c. 0.005 M d. 0.5 M
- Q3. 16 g of oxygen has same number of molecules as in
a. 16g of CO b. 28g of N_2 c. 14 g of N_2 d. 1.0 g of H_2
- Q4. The total number of orbitals associated with third shell will be
a. 2 b. 4 c. 9 d. 3
- Q5. What is the work function of the metal if the light of wavelength 4000\AA generates photoelectrons of velocity $6 \times 10^5 \text{ ms}^{-1}$ from it .
(mass of electron = $9 \times 10^{-31} \text{ kg}$, velocity of light = $3 \times 10^8 \text{ ms}^{-1}$, charge on electron = $1.6 \times 10^{-19} \text{ JeV}^{-1}$)
a. 0.9 eV b. 4.0 eV c. 2.1eV d. 3.1 eV
- Q6. If the radius of second Bohr orbit of He^+ ion is 105.8 pm. What is the radius of the third Bohr orbit of Li^{+2} ion
a. 158.7 pm b. 15.87pm c. 1.587pm d. 158.7A°
- Q7. The sizes of following species increase in the order
a. $Mg^{+2} < Na^+ < F^- < Al$ b. $F^- < Al < Na^+ < Mg^{+2}$
c. $Al < Mg^{+2} < F^- < Na^+$ d. $Na^+ < Al < F^- < Mg^{+2}$
- Q8. Electronic configuration of the most electronegative element is
a. $1s^2 2s^2 2p^6 3s^1$ b. $1s^2 2s^2 2p^6 3s^2 3p^5$ c. $1s^2 2s^2 2p^5$ d. $1s^2 2s^2 2p^6 3s^2 3p^6$
- Q9. In which of the following molecules are all the bonds not equal
a. AlF_3 b. NF_3 c. ClF_3 d. BF_3

- Q10. Which of the following species has tetrahedral geometry
a. BH_4^- b. NH_2^- c. CO_3^{2-} d. H_3O^+
- Q11. Which of the following angle corresponds to sp^2 hybridization
a. 90° b. 120° c. 180° d. 109°
- Q12. The oxidation number of Cr in $\text{Cr}(\text{CO})_6$ is _____
a. 0 b. +2 c. -2 d. +6

Question no. 13 to 16 are Assertion - Reasoning based questions.

- (a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Assertion is false but the Reason is True.
(e) Both A and R are false.
- Q13. **Assertion** : The empirical mass of ethene is half of its molecular mass.
Reason : The empirical formula represents the simplest whole number ratio of various atoms present in a compound.
- Q14. **Assertion** : Significant figures for 0.200 is 3 whereas for 200 it is 1.
Reason : Zero at the end or right of a number are significant provided they are not on the right side of the decimal point.
- Q15. **Assertion** : Black body is an ideal body that emits and absorbs radiations of all frequencies.
Reason : The frequency of radiation emitted by a body goes from a lower frequency to higher frequency with an increase in temperature.
- Q16. **Assertion** : Second ionization enthalpy will be higher the first ionization enthalpy.
Reason : Ionization enthalpy is a quantitative measure of the tendency of an element to lose electron.

SECTION B

- Q17. Copper oxide obtained by heating copper carbonate or copper nitrate contains copper and oxygen in the same ratio by mass. Which law is illustrated by this observation and why? State the law.
- Q18. i. An atomic orbital $n=3$. What are the possible values of l and m_l .
ii. Using s,p,d notation describe the orbital with the following quantum numbers:
 $n=1, l=0, m_l=0, m_s=+1/2$
- Q19. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionize the sodium atom. Calculate the ionisation energy of sodium in kJmol^{-1}
- Q20. What is the IUPAC name and symbol of the element with atomic number 110

OR

Why is the first ionization enthalpy of nitrogen greater than that of oxygen?

- Q21. Why ClO_4^- does not show disproportionation reaction whereas ClO^- , ClO_2^- , ClO_3^- shows.

SECTION C

- Q22. i. In the reaction $A + B_2 \rightarrow AB_2$ identify the limiting reagent if any in the mixture of 300 atoms of A + 200 molecules of B.
ii. Hydrogen gas is prepared in the laboratory by reacting dilute HCl with granulated zinc:
Following reaction takes place :
$$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

Calculate the volume of Hydrogen gas liberated at STP when 32.65 g of Zinc reacts with HCl. 1 mol of gas occupies 22.7 L volume at STP . (Atomic mass of Zn= 65.3u)
- Q23. Write all the Quantum Numbers for $3s^2$. Will all the quantum numbers be same for both electrons . If yes why , if No why ? Explain and name the Rule.
- Q24. What are the frequency and wavelength of a photon emitted during a transition from $n=5$ state to $n=2$ state in hydrogen atom.

OR

- i. A golf ball has a mass of 40g and speed of 45m/s. If the speed can be measured with accuracy of 2%, calculate the uncertainty in position.
ii. Is Uncertainty Principle applicable for macroscopic particles . Justify .
- Q25. i. Out of F and Cl which element would have a more negative electron gain enthalpy.
ii. How would you explain the fact that first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium .
- Q26. State the type of hybrid orbitals associated with S in SF_6 and Xe in XeF_4 and draw and name the structure .

OR

Draw the resonating structures of SO_3 , SO_4^{2-} .

- Q27. i. Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, bond angle in water is less than that of ammonia . Explain.
ii. Which bonds are more stronger sigma or π . Explain.
iii. Which out of NH_3 and NF_3 has higher dipole moment. Why ?
- Q28. Balance the following equation using Ion electron method or Oxidation Number method in basic medium :
- $$MnO_4^- (aq) + I^- (aq) \rightarrow MnO_2 (s) + I_2 (s)$$

SECTION D

Q29 Read the passage and answer the question given below:

The photoelectric effect is a phenomenon in which electrons are ejected from the surface of a metal when light is incident on it. These ejected electrons are called photoelectrons. It is important to note that the emission of photoelectrons and the kinetic energy of the ejected photoelectrons is dependent on the frequency of the light that is incident on the metal's surface. The process through which photoelectrons are ejected from the surface of the metal due to the action of light is commonly referred to as photoemission.

The photoelectric effect occurs because the electrons at the surface of the metal tend to absorb energy from the incident light and use it to overcome the attractive forces that bind them to the metallic nuclei.

- i. In a photoelectric experiment for 4000 Å incident radiation, the potential difference to stop the ejection is 2 V. If the incident light is changed to 3000 Å, What will be the potential required to stop the ejection of electrons ?
- ii. How does the intensity of light affect photoelectrons?
- iii. Calculate energy if 2mole of photons of radiation whose frequency is 5×10^{14} Hz.
- iv. The work function of some metal are given below. The number of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metal

Metal	Li	Ag	K	W	Mg
Wo(eV)	2.4	4.3	2.2	4.75	3.7

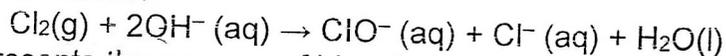
OR

What is line spectrum. Explain using example.

Q30. Read the passage and answer the question given below:

Redox reactions are reactions in which oxidation and reduction takes place simultaneously. Oxidation number are assigned in accordance with the set of rules. Oxidation number and ion electron methods both are used in balancing ionic equations. Redox reactions are classified as combination, decomposition, displacement and disproportionation reactions. The concept of redox couple and electrode processes is basis of electrolysis and electrochemical cells.

i. The reaction



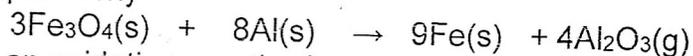
represents the process of bleaching. Identify and name the species that bleaches the substances due to their oxidising action.

ii. Calculate the oxidation number of phosphorus in the following species.

(a) HPO_3^{2-} and

(b) PO_4^{3-}

iii. Explain why

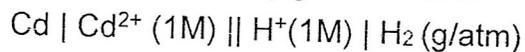


is an oxidation reaction?

iv. What happens if the salt bridge dries out? What are the functions of salt bridge.

OR

Consider the following galvanic cell.



(i) Write the overall cell reaction

(ii) What do the double vertical lines denote?

SECTION E

Q31. i. A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formula. (3)

ii. If the density of methanol is 0.793 kgL^{-1} . What is its volume needed for making 2.5L of its 0.25 M solution. (2)

OR

i. How many moles of methane are required to produce 22g CO_2 (g) after combustion.

ii. Volume of a solution changes with change in temperature, then, will the molality solution be affected by temperature? Give reason for your answer.

iii. The reactant which is entirely consumed in the reaction is known as a limiting reagent.

In the reaction $2A + 4B \rightarrow 3C + 4D$, when 5 moles of A react with 6 moles of B, then

- (i) Which is the limiting reagent?
- (ii) Calculate the amount of C formed?

- Q32.** i. What is the basic difference in approach between Mendeleev's Periodic Law and Modern Periodic Law.
- ii. On the basis of Quantum number, justify that the sixth period of the periodic table should have 32 elements.
- iii. Explain why anions are larger in radii than their parent atoms.
- iv. The first ionization enthalpy values (in kJmol^{-1}) of group 13 elements are:

B	Al	Ga	In	Tl
801	577	579	558	589

How will you explain this deviation from the general trend. (1+1+1+2)

OR

Write the characteristics of d block elements and its general electronic configuration. (4+1)

- Q33.** Using molecular orbital theory write energy level in increasing order, compare the bond energy and magnetic character and stability of N_2^+ and N_2^- .

OR

- i. Explain the non linear shape of H_2S and non planar shape of PCl_3 using valence shell electron pair repulsion theory.
- ii. Explain why BeH_2 molecule has a zero dipole moment although the Be-H bonds are polar.
- iii. Name the two conditions which must be satisfied for hydrogen bonding to take place in a molecule.
- iv. Out of o-nitrophenol and p-nitrophenol, which has higher boiling point. Why?
- v. Write the hybridization of H_2O (1+1+1+1+1)