BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

MID-TERM EXAMINATION 2023-24

MARKING SCHEME CHEMISTRY (043)

Class: XI **Duration: 3 Hrs**
Date: 16/10'23 **Max. Marks: 70**

SECTION A

The following questions are multiple -choice questions with one correct answer. Each question carries 1-mark. There is no internal choice in this section.

1. **(d) 6 x 10^{23}**
2. (b) 1.99 x 10^{-23} g
3. (a) An element
4. (d) 25
5. (d) y-rays
6. (c) 3
7. (c) Electron 3 > Electron 2 > Electron 4 > Electron 1
8. (c) X_2O_3, amphoteric
9. (d) 2
10. (c) ns^2np^5
11. (b) A_2B_3
12. (d) 4

Directions: The questions below consists of an assertion and a reason. Use the following key to choose the appropriate answer.

(a) If both assertion and reason are correct and reason is correct explanation of the assertion.
(b) If both assertion and reason are correct, but the reason is not the correct explanation of the assertion.
(c) If assertion is correct, but reason is incorrect.
(d) If assertion is incorrect, but reason is correct.

13. Answer: (d)
14. Answer: (c)
15. Answer: (d)
16. Answer: (a)

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. Solution

Given,$ss\ of$ A $added$=2 g

$Mass\ of\ water$ =18 g

$Mass\ of\ solution$ =2 g+18 g=20 g

We know,

$Mass\ percent\ of$ A(solute)=Mass of A Mass of solution×100

=2 g/ 2 g of A+18 g of water×100

=2 g /20 g×100=10%

Final Answer: 10%

18. Molar mass of water (H2O) = 2 + 16 = 18 u.

Molar mass of HNO3 = 1 + 14 + (3 × 16)

Molar mass of HNO3 = 1 + 14 + 48 = 63 g/mol.

19. Here,λ=3.6×10−10m

We know , de-Broglie wavelength

λ = hp ⇒ λ = hmv ⇒m= hλv

Now,

λ=3.6 ˚A=3.6× 10−10m

Velocity of photon = Velocity of light

m=hλv = 6.626×10−34Js−1(3.6×10−10m)(3×108ms−1)

=6.135×10−29kg

OR

Given: mass of the ball (m) =0.1 kg

velocity of the ball (v)= 10 m sec−1

Calculation for wavelength of the ball

∵We know from de-Broglie equation:λ=h/mv

Where, λ=wavelength of the particle = ?

h→Planck's constant=6.626×10−34 Js

m→mass of the particle=0.1 kg

v→velocity of the particle=10 ms−1

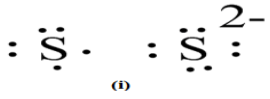
Substituting the values, we get

λ=6.626×10−34J sec/0.1kg×10 m sec−1

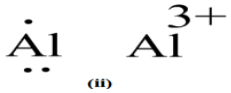
⇒λ=6.626×10−34m {F=ma=kg×msec2;W=F.dx=kg×m2sec2=J}

Final answer : wavelength of the ball (λ)=6.626×10−34m.

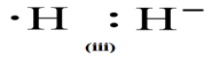
20. Atomic radius is defined as a distance from the centre of the nucleus to the outermost shell containing the electrons. Ionic radius is a measure of an atoms ion in a crystal lattice and which is a half distance between two ions that are barely touching each other.



(i)



(ii)



(iii)

21.

(a) S and S^{2-} (b) Al and Al^{3+}

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22.

Answer :

(i) 1 mole of C_2H_6 contains 2 moles of carbon atoms.

$\therefore$ Number of moles of carbon atoms in 3 moles of C_2H_6

$= 2 \times 3 = 6$

(ii) 1 mole of C_2H_6 contains 6 moles of hydrogen atoms.

$\therefore$ Number of moles of carbon atoms in 3 moles of C_2H_6

$= 3 \times 6 = 18$

(iii) 1 mole of C_2H_6 contains 6.023×10^{23} molecules of ethane.

$\therefore$ Number of molecules in 3 moles of C_2H_6

$= 3 \times 6.023 \times 10^{23} = 18.069 \times 10^{23}$

23. (a) Explanation: 1 mole of He contains 6.023×10^23 atoms. 1 mole of He = 4 gm of He. So, 24 gm of He

. contains — (24÷4)×6.023×10^23 atoms = 36.138×10^23He atoms.

1 mole of $CuSO_4$ contains 1 mole of copper.

Molar mass of $CuSO_4$ = (63.5) + (32.00) + 4(16.00)

= 63.5 + 32.00 + 64.00

= 159.5 g

159.5 g of $CuSO_4$ contains 63.5 g of copper.

$\Rightarrow$ 100 g of $CuSO_4$ will contain $\frac{63.5 \times 100\,g}{159.5}$ of copper.

$\therefore$ Amount of copper that can be obtained from 100 g $CuSO_4$ $= \frac{63.5 \times 100}{159.5}$

= 39.81 g

(b)

24.

(a) lithium (Li). (b) Phosphorus (c) Scandium

25.

Solution

I)$E=h\nu = hc / \lambda = 6.626\times10^{-34}\times3\times10^{8}/4\times10^{-7}$

$=4.97\times10^{-19}J$

$=4.97\times10^{-19} / 1.6\times10^{-19}=3.1eV$

ii) kinetic energy of emission,

$=h\nu - h\nu_0 = 3.1 - 2.13 = 0.97eV$

iii) $1/2mv^2 = 0.97eV = 0.97\times1.6\times10^{-19}$

$1/2(9.11\times10^{-31})\times v^2 = 0.97\times1.6\times10^{-19}$

$v^2 = 34.1\times10^{10}$

$v = 5.84\times10^{5} ms^{-1}$

26.

(a) (a) All the given species contain same number of electrons (10). Hence, they are isoelectronic species. With increase in the nuclear charge, the ionic size decreases.

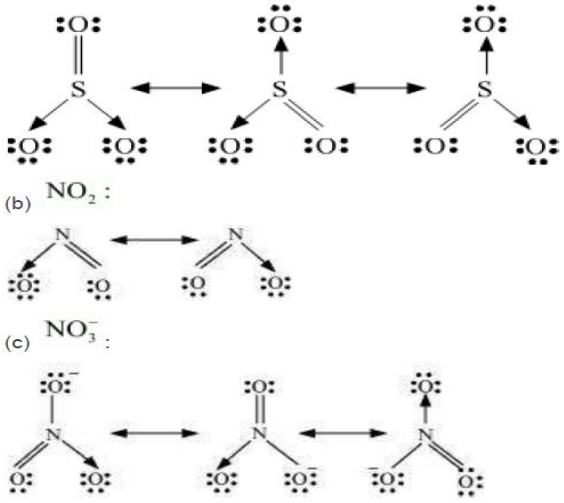
(b) The increasing order of ionic radii is Al3+<Mg2+<Na+<F−<O2−<N3−.

OR

Metals	**Non-metals**
They are solid at room temperature.	They may be solid, liquid and gas at room temperature.
They have high melting and boiling points.	They have low melting and boiling points.
They are good conductors of heat and electricity.	They are bad conductors of heat and electricity.

27. A sigma bond is stronger than the pi bond due to a greater and stronger overlap of orbitals. The strength of the bond depends upon the bond length as well. The greater the bond length, the weaker the bond is. A sigma bond is stronger than the pi bond due to the shorter bond length.
Sigma bonds (σ) are the first type of covalent bond, formed by overlap of atomic orbitals head-to-head. They are found in single, double, and triple bonds. Pi bonds (π) are the second and third types of covalent bonds, formed by overlap of p orbitals side-to-side. They only exist in double and triple bonds.

28.



SECTION D

The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

29. (a) Microscopic.

(b) n

(c) Azimuthal quantum number , Size

OR

Using s, p, d, f notations, describe the orbital with the following quantum numbers.

(i) 2p

(ii) 5f

30.

(a) Periods

(b) Atomic number

(c) Unnilseptium and Ununbium.

OR

18- groups and 7-periods in modern periodic table.

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. (a) Which out of NH3 and NF3 has higher dipole moment and why?

(b) Describe the shapes of sp , sp^2 , sp^3 hybrid orbitals.

OR

(a) Explain the types of H-Bonds.

(b) Discuss the shape of the following molecules using the VSEPR model:

$BeCl_2$, BCl_3 , PH_3

32. (a) The basic theme of organisation of elements in the periodic table is to classify the elements in periods and groups according to their atomic number (number of protons) and their properties respectively. This arrangement makes the study of elements and their compounds simple and systematic.

(b) The ionization enthalpy is the amount of energy required to remove an electron from ground state to infinity.

The energy of electron in the ground state is −2.18×10−18J.

The energy of electron at infinity is zero.

The energy required to remove electron is 0−(−21.8×10−18J) = 2.18×10−18J.

To remove 1 mole of electrons, the amount of energy required is 2.18×10−18 × 6.023×1023 = 13.130×105J/mol. This is the ionization enthalpy of hydrogen.

OR

(a) (i) Nitrogen is an element with five electrons in its outershell.
(ii) Magnesium is an element which tends to lose two electrons.
(iii) Oxygen is an element that would tend to gain two electrons.

(b) (i) For n=3, the period in which the element belongs is third. The electronic configuration is 3s23p4 and the element belongs to p block. The group number of the element is 10+ number of electrons in the valence shell.

=10+6=16

Thus, the element belongs to third period and sixteenth group.

(ii) For n=4, the period in which the element belongs is fourth. The electronic configuration is 3d24s2 and the element belongs to d block. The group number of the element is = number of electrons in the (n−1)d subshell + number of electrons in ns subshell=2+2=4

Thus, the element belongs to fourth period and fourth group.

33. Attempt any five of the following:

(a) **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$ or [Ar] $4s^2$**

(b) $h\nu = h\nu_0 + \frac{1}{2} m_e v^2$

(c) Hence, the number of photons with a wavelength of 4000 pm and energy of 1 J are 2.012×10^{16} .

(d) [Ne] $3s^1$.

(e) 16

(f) $\lambda = h/(2mK.E)^{1/2}$

$\lambda = 6.626\times10^{-34} / (2\times9.1\times10^{-31}\times3\times10^{-25})^{1/2} = 1.2\times10^{-7}m$

(g) Pauli's Exclusion Principle states that no two electrons in the same atom can have identical values for all four of their quantum numbers..

***** Best of luck*****