

Set-B

Final Examination-2020-21

L-90

Chemistry

Class 11

u-21  
Sequence A  
stappled as per papers  
correct  
M. M. 70

Time 3 hrs.

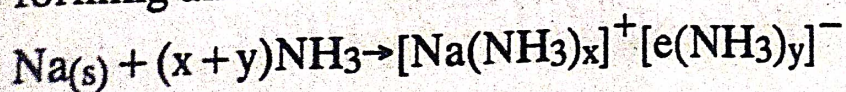
**General Instructions :**

- (i) There are 33 questions in this question paper. All questions are compulsory.
- (ii) 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.
- (iii) Section B : Q. No. 17 to 25 are short answer questions and carry 2 marks each.
- (iv) Section C : Q. No. 26 to 30 are short answer questions and carry 3 marks each.
- (v) Section D : Q. No. 31 to 33 are long answer questions carrying 5 marks each.
- (vi) There is no overall choice. However, internal choices have been provided.
- (vii) Use of calculators and log tables is not permitted.

**Section – A**

1 Read the passage and answer the following questions :

The group 2 elements comprise beryllium, magnesium, calcium, strontium, barium and radium. They follow alkali metals in the periodic table. The alkaline earth metals are less reactive than alkali metals. The reactivity of alkaline earth elements increases on going down the group. The alkaline earth metals dissolve in liquid ammonia to give deep blue black solutions forming ammoniated ions.



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Beryllium and magnesium are kinetically inert to oxygen and water because of the formation of an oxide film on their surface. However, powdered beryllium burns brilliantly on ignition in the air to give  $\text{BeO}$  and  $\text{Be}_3\text{N}_2$ . Calcium, strontium, and barium are readily attacked by air to form the oxide and nitride. All the elements except beryllium combine with hydrogen upon heating to form their hydrides,  $\text{MH}_2$ . Beryllium is used in the manufacture of alloys. Copper-beryllium alloys are used in the preparation of high strength springs. Metallic beryllium is used for making windows of X-ray tubes.

(i) Magnesium is more electropositive and burn with dazzling brilliance in the air to give :

(a)  $\text{MgO}$

(b)  $\text{Mg}_3\text{N}_2$

(c) both (a) and (b)

(d) none of these

(ii) Thermal decomposition of  $(\text{NH}_4)_2\text{BeF}_4$  is the best route for the preparation of compound A. Identify the compound A ?

(a)  $\text{BeF}_2$

(b)  $\text{BeF}_4$

(c) Be

(d) F

Or

Find the incorrect trend for alkaline earth metals :

(a) atomic size  $\text{Be} < \text{Mg} < \text{Ca} < \text{Sr}$

(b) second ionization energy  $\text{Be} < \text{Mg} < \text{Ca} < \text{Sr}$

(c) Hydration enthalpy  $\text{Sr} < \text{Ca} < \text{Mg} < \text{Be}$

(d) Density  $\text{Ca} < \text{Mg} < \text{Be} < \text{Sr}$

(iii) Which of the following element is used for the treatment of cancer ?

(i) calcium

(ii) strontium

(iii) barium

(iv) radium

( 5 )

5 Assertion : The sum of  $154.2 + 6.1 + 23$  is 183.

Reason : The result of addition is reported to the same number of decimal places as that of the term with least number of decimal places :

- (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.

6 Assertion : Diamond is a bad conductor of electricity.

Reason : All C-C bond lengths in diamond are of 154 pm.

- (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.

7 How many molecules of  $H_2O$  are there in 18g of water ?

(Hint : Avogadro's Number =  $6.02 \times 10^{23}$  atoms/mol)

- (a)  $6.02 \times 10^{23}$  (b)  $5.02 \times 10^{23}$
- (c)  $8.02 \times 10^{23}$  (d)  $7.02 \times 10^{23}$

8 How many neutrons and protons are there in the  $^{13}_6C$  nucleus ?

- (a) 0, 13 (b) 8, 5 (c) 8, 6 (d) 7, 6

Or

Number of protons in sodium are 11. number of electrons in outermost shell will be :

- (a) 8 (b) 1 (c) 2 (d) 3

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- 9 A gas decolourised by  $\text{KMnO}_4$  solution but gives no precipitate with ammonical cuprous chloride is .....
- (a) Methane (b) Ethene  
(c) Ethane (d) Acetylene
- 10 By convention, standard enthalpy for the formation of an element in reference state is :

- (a) zero (b)  $< 0$   
(c) unity (d) different for each element

Or

Which of the following statement is not correct ?

- (a)  $\Delta G$  is positive for a non-spontaneous reaction  
(b)  $\Delta G$  is zero for a reaction at equilibrium  
(c)  $\Delta G$  is positive for a spontaneous reaction  
(d)  $\Delta G$  is negative for a spontaneous reaction
- 11 Alkaline earth metals are :

- (a) more reactive (b) less reducing  
(c) more oxidizing (d) less basic than alkali metals  
(a) A and C (b) B and D  
(c) A and B (d) C and D

Or

Which one of the following is highly radioactive ?

- (a) Francium (b) Lithium  
(c) Rubidium (d) Caesium
- 12 Which product is obtained by passing ethanol vapours over heated alumina ?

- (a)  $\text{C}_2\text{H}_2$  (b)  $\text{C}_2\text{H}_6$   
(c)  $\text{C}_2\text{H}_4$  (d)  $\text{CH}_4$

( 3 )

(iv) The reducing nature of beryllium is due to :

(i) large hydration energy      (ii) small size of  $\text{Be}^{2+}$  ion

(iii) large value of the atomization enthalpy      (iv) all of these

2 Read the passage and answer the following questions :

The orbital wave function or  $\psi$  for an electron in an atom has no physical meaning. In orbital the probability density is maximum at the nucleus and it decreases sharply as we move away from it. After reaching a small maxima it decreases again and approaches zero as the value of  $r$  increases further. These probability density variation can be visualised in terms of charge cloud diagrams. Boundary surface diagrams of constant probability density for different orbitals give a fairly good representation of the shapes of the orbitals. A boundary surface or contour surface is drawn in space for an orbital on which the value of probability density  $|\psi|^2$  is constant. The size of the  $s$  orbital increases with increase in  $n$ , that is,  $4s > 3s$   $2s > 1s$  and the electron is located further away from the nucleus as the principal quantum number increases.

In these questions, a statement of assertion following 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 : The square of the wave function (i.e.,  $\psi^2$ ) at a point gives the probability density of the electron at that point.

Reason : For  $2s$  orbital the probability density first decreases sharply to zero and against  $r$  increasing.

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(ii) Assertion : The total number of nodes are given by  $(n-2)$ .

Reason : The probability density functions for the np and nd orbitals are zero at the plane.

(iii) Assertion : Number of nodes for 2s orbital is one, two for 3s.

Reason : Number of nodes increases with increase of principal quantum number n.

(iv) Assertion : The region where the probability density function reduces to zero is called nodal surfaces.

Reason : The five d-orbitals are designated as  $dx^2$ ,  $dxy$ ,  $dzy^3$ ,  $dx^2$  and  $dz^2$

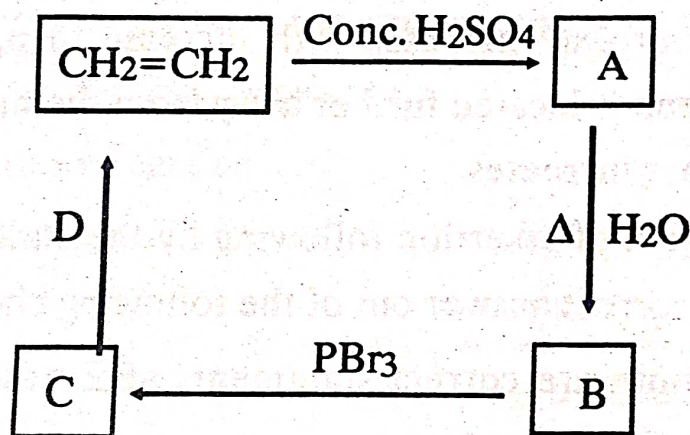
Or

Assertion : The probability density function is zero on the plane where the two lobes touch each other.

Reason : Each p orbital consists of two sections called lobes.

3

Identify B and D in the following sequence of reactions :



(a) Ethyl-hydrogensulphate + alcoholic KOH

(b) Methanol, and Bromoethane

(c) Ethanol and alcoholic KOH

(d) Ethyl - hydrogensulphate + aqueous KOH

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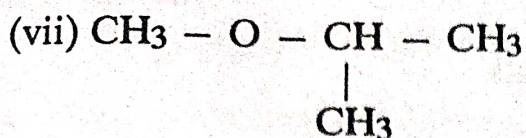
The product of the magnitude of the charge and the distance between the centres of positive and negative charge is called .....

(a) Dipole moment

(b) ionic character

(c) covalent character

(d) electronegativity

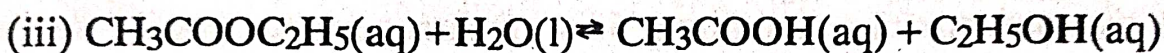
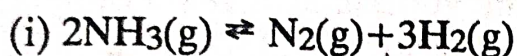


Identify the pairs of compound that represent chain isomerism.

19 Derive a relationship between  $K_p$  and  $K_c$ .

Or

Which of the following reactions involve homogeneous equilibrium and which involve heterogeneous equilibrium ?



20 Show the polarization of carbon-magnesium bond in the following structure :  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{Mg} - \text{X}$ .

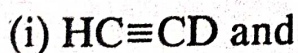
Or

Why is a solution of potassium hydroxide used to absorb carbon dioxide evolved during the estimation of carbon present in an organic compound ?

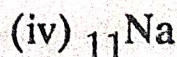
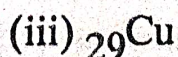
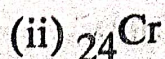
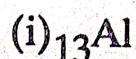
21 Explain the following : Soft water lathers with soap but not hard water.

22 Give chemical reactions to show the amphoteric nature of water.

23 Write equations for the preparation of :

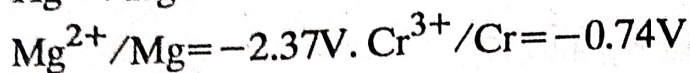
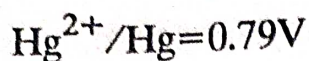
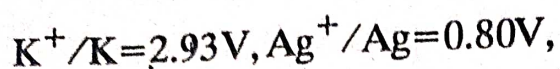


24 Predict the periods and blocks to which each of the following elements belong ?



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25 Given the standard electrode potentials :



arrange these metals in their increasing order of reducing power.

### Section – C

26 2.9 g of a gas at 95°C occupied the same volume as 0.184 g of hydrogen at 17°C at the same pressure. What is the molar mass of the gas?

Or

A gaseous mixture containing 50 g of nitrogen and 10g of oxygen were enclosed in a vessel of 10 L capacity at 27°C. Calculate

- (i) the number of moles of each gas.
- (ii) the partial pressure of each gas.
- (iii) the total pressure of gaseous mixture.

27 Why is H<sub>2</sub>O a liquid and H<sub>2</sub>S a gas ?

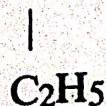
28 Calculate the work done when 11.2 g of iron dissolves in hydrochloric acid in :

- (i) a closed vessel
  - (ii) an open beaker at 25°C
- (Atomic mass of Fe = 56u)

Or

Derive  $\Delta H = \Delta U + \Delta n_g RT$  from  $H = U + PV$

29 Write the IUPAC names of the following compounds :





13 In the Thomson Model of Atom :

- (a) electrons move in circular orbits around nucleus.
- (b) electrons are embedded in a positively charged pudding or water melon
- (c) electrons swarm like flies around nucleus
- (d) electrons oscillate about the nucleus

14 Assertion (A) : The temperature at which vapour pressure of a liquid is equal to the external pressure is called boiling temperature.

Reason (R) : At high altitude atmospheric pressure is high.

- (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

Assertion (A) : Liquids tend to have maximum number of molecules at their surface.

Reason (R) : Small liquid drops have spherical shape :

- (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.

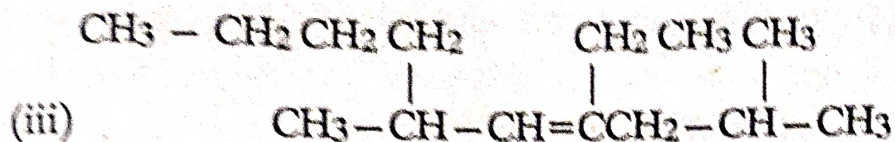
15 Assertion (A) : In the reaction between potassium permanganate and potassium iodide, permanganate ions act as an oxidising agent.

Reason (R) : Oxidation state of manganese changes from +2 to +7 during the reaction :

- (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) Both A and R are false.

P. T. O.



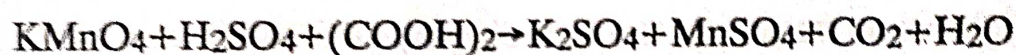


Also calculate the number of  $\sigma$  and  $\pi$  -bonds.

- 30 Two oxides of a metal contain 27.6% and 30.0% of oxygen respectively. If the formula of the first oxide is  $\text{M}_3\text{O}_4$ , find that of the second.

Or

Balance the following skeleton equation by the method of partial equations :

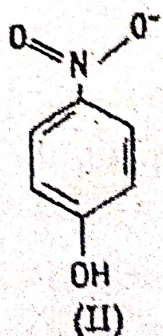
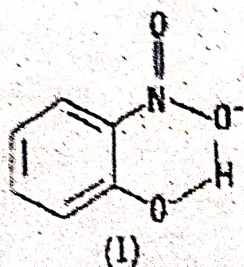


#### Section - D

- 31 What is meant by the term bond order? Calculate the bond order of :  
 $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{O}_2^+$ ,  $\text{O}_2^-$

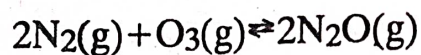
Or

Structures of molecules of two compounds are given below :



- (i) Which of the two compounds will have intermolecular hydrogen bonding and which compound is expected to show intramolecular hydrogen bonding?
- (ii) The melting point of a compound depends on among other things, the extent of hydrogen bonding. On this basis, explain which of the above two compounds will show higher melting point ?
- (iii) The solubility of compounds in water depends on the power to form hydrogen bonds with water. Which of the above compounds will form a hydrogen bond with water easily and be more soluble in it ?

32 Reaction between nitrogen and oxygen takes place as follows :



If a mixture of 0.482 mol of  $\text{N}_2$  and 0.933 mol of  $\text{O}_2$  is placed in a reaction vessel of volume

10 L and allowed to form  $\text{N}_2\text{O}$  at a temperature for which  $K_c = 2.0 \times 10^{-37}$  determine the composition of the equilibrium mixture.

Or

(a) Show that  $\text{pH} + \text{POH} = 14$

(b) Derive relationship between solubility and solubility product.

33 Draw the structure of :

(i) 2-Chlorohexane

(ii) Pent-4-en-2-ol,

(iii) Nitrocyclohexane

(iv) Benzylpent-1-ene

(v) 6-Methyl, 6-Hydroxyheptanal

Or

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

(1)  $\text{Cl}_3\text{CCOOH} > \text{Cl}_2\text{CHOOH} > \text{ClCH}_2\text{COOH}$

(2)  $\text{CH}_3\text{CH}_2\text{COOH} > (\text{CH}_3)_2\text{CHOOH} > (\text{CH}_3)_3\text{C} \cdot \text{COOH}$