

## Sample paper 1

**Question 1**

The theory which could explain the law of chemical composition is

- a) Avogadro's law
- b) Gay Lussac's law
- c) Dalton's atomic theory
- d) Antoine Lavoisier theory t
- e) None of these

**Correct Answer:** c) Dalton's atomic theory

**Explanation:**

Dalton's atomic theory explains the law of chemical composition. Avogadro's law states that, at same temperature and pressure, equal volume of gas contains Avogadro number of particles. Gay Lussac's law explains about gaseous volume. Antoine Lavoisier theory explains about law of conservation of mass.

**Question 2**

The rate at which a gas escapes through a pin-hole into a vacuum is called

- a) Diffusion
- b) Effusion
- c) Decomposition
- d) Displacement
- e) Evaporation

**Correct Answer:** b) Effusion

**Explanation:**

The rate at which a gas escapes through a pinhole into a vacuum is called Effusion. Diffusion is the rate at which two gases mix. Decomposition is breaking down of complex molecules to simple ones. Displacement reaction is replacement of one element in a compound by other element. Evaporation is a process where molecules get vapourised.

**Question 3**

Pick out the correct example for semi-conductors

- a) NaCl
- b) Si-Ge
- c) Nb<sub>3</sub>Ge alloy
- d) Sulphur compound
- e) SiO<sub>2</sub>

**Correct Answer:** b) Si-Ge

**Explanation:**

Si-Ge is a semi conductor. Its conductivity is due to the presence of impurities in the compound. NaCl is a conductor. Nb<sub>3</sub>Ge is a super conductor. Sulphur compound is used as rubber products, so it is an insulator. SiO<sub>2</sub> is sand and is also an insulator.

#### Question 4

**Which of the following binary systems is completely miscible on raising the temperature?**

- a) Phenol-H<sub>2</sub>O
- b) Aniline-Hexane
- c) H<sub>2</sub>O-Aniline
- d) Carbon disulphide-Methyl alcohol
- e) All of these

**Correct Answer:** e) All of these

**Explanation:**

All the above binary mixtures are completely miscible on raising the temperature. The consolute temperature for Phenol-H<sub>2</sub>O is 68.10°C, for Aniline-Hexane it is 59.60°C, for H<sub>2</sub>O-Aniline it is 167.0°C, for Carbon disulphide-Methyl alcohol it is 40.50°C. The consolute temperature is the critical temperature below or above which a mixture is completely miscible.

#### Question 5

**The oxidation number of a Group VIIA element in a compound is**

- a) +1
- b) -1
- c) 0
- d) +2
- e) Depends upon the element combined with an electronegative atom

**Correct Answer:** e) Depends upon the element combined with an electronegative atom

**Explanation:**

The oxidation number of a Group VIIA element in a compound is -1, except when that element is combined with one having higher electronegativity. For example, oxidation number of Cl in HCl is -1, but the oxidation number of Cl in HOCl is +1.

**Question 6**

When the pressure of the system remains constant during each step of a process, such process is said to be

- a) Isothermal process
- b) Adiabatic process
- c) Isochoric process
- d) Isobaric process
- e) None of these

**Correct Answer:** d) Isobaric process

**Explanation:**

For an isobaric process, pressure remains constant. For an isothermal process, temperature of the system remains constant. In an adiabatic process, no heat enters or leaves the system. In an isochoric process, volume remains constant.

**Question 7**

Which is the first element in the periodic table to have '4d' electrons in its electronic configuration?

- a) Ca
- b) Sc
- c) Rb
- d) Y
- e) La

**Correct Answer:** d) Y

**Explanation:**

Yttrium (Y) has the first 4d electrons in its electronic configuration among the others. Its atomic number is 39 and its electronic configuration is [Kr] 4d<sup>1</sup> 5s<sup>2</sup>. The atomic number of calcium (Ca) is 20; its electronic configuration is [Ar] 4s<sup>2</sup>. The atomic number of strontium (Sc) is 38; its electronic configuration is [Kr] 5s<sup>2</sup>. The atomic number of Rb is 37; its electronic configuration is [Kr] 5s<sup>1</sup>. The atomic number of lanthanum (La) is 57; its electronic configuration is [Xe] 5d<sup>1</sup> 6s<sup>2</sup>.

**Question 8**

Among the following, which group of elements have the maximum ionisation energy?

- a) Alkali elements
- b) Chalcogens
- c) Halogens
- d) Noble gases
- e) Both b and c

**Correct Answer:** d) Noble gases

**Explanation:**

Ionisation energy is the energy required to remove the most loosely bound electron from an isolated atom in the gaseous state. In a period, the value of ionisation potential increases from left to right. Thus, noble gases have more ionisation energy than others.

#### Question 9

**When a covalent bond breaks in such a way that the shared pair of electrons stay on any one of the bonded atoms, such a reaction is called**

- a) Decomposition reaction
- b) Homolytic fission reaction
- c) Heterolytic fission reaction
- d) Heterolytic fission reaction
- e) Thermal fission

**Correct Answer:** c) Heterolytic fission reaction

**Explanation:**

The heterolytic reaction is also called as heterolysis. A covalent bond breaks in such a way that the shared pair of electrons stays on any one of the bonded atoms is called the heterolysis. The atom, which carries the unshared pair of electrons, is represented as  $A^-$ : Ex:



In Homolytic fission reaction, the covalent bond undergoes fission reaction where the shared pair of electrons is shared between each bonded atom.

Ex:



#### Question 10

**Pick out the correct statement.**

- a) Red litmus paper is used to identify acids
- b) Dry litmus paper is used to test water-soluble gas
- c) Blue litmus paper is used to identify acids
- d) Blue litmus paper is used to identify bases
- e) None of these

**Correct Answer:** c) Blue litmus paper is used to identify acids

**Explanation:**

Blue litmus paper turns into red color when it dips in acidic solution. Red litmus paper turns into blue color when it dips in basic solution. Wet litmus paper is used to test water-soluble gas.

**Question 11**

The NMR spectrum of ethylene glycol molecule will have

- a) Two singlets
- b) A triplet and a doublet
- c) Two doublets
- d) A singlet and a doublet
- e) Two triplets

**Correct Answer:** a) Two singlets

**Explanation:**

The molecule ethylene glycol ( $\text{HO}-\text{CH}_2\text{CH}_2-\text{OH}$ ) is a symmetric molecule. The proton in the  $-\text{OH}$  gives one singlet peak and the proton in the methylene group of  $-\text{CH}_2-$  gives another singlet peak. So, it gives two singlet peaks only. Since it is a symmetric molecule, it does not give peak for another  $-\text{CH}_2\text{OH}$  group.

**Question 12**

Which of the following is a Bronsted-Lowry acid?

- a)  $\text{CH}_2=\text{CH}_2$
- b)  $\text{CH}_3\text{NH}_2$
- c)  $\text{CH}_3\text{CO}_2\text{H}$
- d)  $\text{CH}_3\text{COCH}_3$
- e)  $\text{C}_6\text{H}_{10}$

**Correct Answer** c)  $\text{CH}_3\text{CO}_2\text{H}$

**Explanation:**

All Bronsted-Lowry acids will liberate a proton. The net charge may be zero, (+) or (-). In the above-mentioned options, acetic acid ( $\text{CH}_3\text{CO}_2\text{H}$ ) is the only molecule, which liberates a proton and acts as a proton donor.

**Question 13**

Choose the correct phrase(s) for the following half-cell reaction  $\text{Cu}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{Cu}_{(\text{aq})}$

I. It is a reduction reaction.

II. Reaction takes place in anode

III.  $\text{Cu}^{2+}$  is an oxidising agent.

- a) I & II
- b) I & III
- c) II & III
- d) I only

e) II only

**Correct Answer:** c) I & III

**Explanation:**

It is one of the half-cell reactions that take place in the Daniel cell. The above half-cell reaction takes place in cathode. It undergoes a reduction reaction, where  $\text{Cu}^{2+}$  acts as an oxidising agent and Cu acts as a reducing agent.

#### Question 14

**The scale which is based on an empirical relation between the energy of a bond and the electronegativities of bonded atoms is**

- a) Pauling scale
- b) Mulliken's scale
- c) Sanderson's scale
- d) Alfred and Rochow's scale
- e) Both a and b

**Correct Answer:** a) Pauling scale

**Explanation:**

Pauling scale is based on an empirical relation between the energy of a bond and the electronegativities of bonded atoms. Mulliken scale of electronegativity is based on ionisation energy and electron affinity of an atom.

#### Question 15

**Systematic error is also called**

- a) Experimental error
- b) Random error
- c) Indeterminate error
- d) Determinate error
- e) None of these.

**Correct Answer:** d) Determinate error

**Explanation:**

Determinate error is also called systematic error. Determinate errors are those, which are known and controllable errors. Ex: Instrumental errors and personal errors. Indeterminate errors are those, which are unknown errors. Ex: room temperature. It is also called random errors.