

## Sample paper 6

### Question 1

In dehydrohalogenation, which of the following is used to remove hydrogen from alkyl halide?

- a) Base
- b) Acid
- c) Leaving group
- d) Double bond
- e) Solvent

**Correct Answer:** a) Base

#### Explanation:

In dehydrohalogenation, a strong base is required to remove hydrogen from alkyl halide and thus it forms alkene as a product. It is also known as  $\beta$ -elimination reaction.

### Question 2

25. A crystal plane has intercepts of  $a$ ,  $b/2$  and  $3c/2$  along the X, Y and Z axes respectively. What are its Millar indices?

- a)  $(1 \ 1/2 \ 3/2)$
- b) (123)
- c)  $(122/3)$
- d) (362)
- e) (243)

**Correct Answer:** d) (362)

#### Explanation:

Miller indices are a set of integers (h, k, and l), which are used to describe a given plane in a crystal.

The procedure for determining the Miller indices for a plane:

1. Take the intercepts of the plane (a, b, c) with these axes.
2. Invert all the numbers.
3. Clear fractions to obtain h, k and l

For the above plane, the miller indices can be calculated as follows

The plane:  $a, b/2, 3c/2$

Intercepts:  $1, 1/2, 3/2$

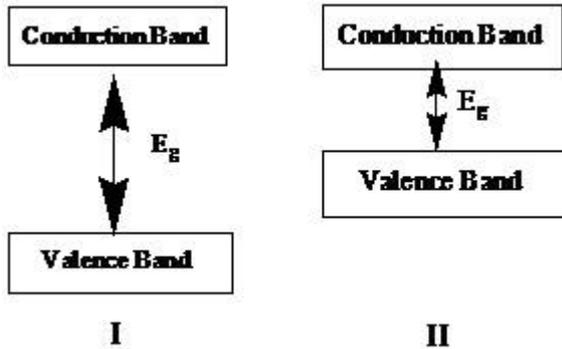
Reciprocals:  $1, 2, 2/3$

Clear fractions:  $3, 6, 2$

Hence, the Miller indices are (362)

### Question 3

The energy band diagram corresponds to



- a) I-Conductor, II-Insulator
- b) I-Semiconductor, II-Insulator
- c) I-Insulator, II-Conductor
- d) I-Insulator, II-Semiconductor
- e) I-Conductor, II-Semiconductor

**Correct Answer:** d) I-Insulator, II-Semiconductor

#### Explanation:

The energy band diagram I corresponds to an insulator in which the energy gap is very high. The diagram II corresponds to a semiconductor in which the energy gap is small compared to that of an insulator.

### Question 4

The respiration process of human beings is based on the principle of

- a) Boyle's law
- b) Charles law
- c) Dalton's law of partial pressure
- d) Graham's law
- e) Both a)&b)

**Correct Answer:** a) Boyle's law

#### Explanation:

During inhalation of gas, pressure inside the lung drops below the air pressure decreases and the chest cavity expands and thus volume gets increased. This shows that pressure and volume are inversely related to each other.

### Question 5

In the given reaction, which element gets oxidised?



- a) I
- b) S
- c) H
- d) I and S
- e) S and H

**Correct Answer:** b) S

**Explanation:**

The oxidation state of Iodine goes from 0 in  $\text{I}_2$  to -1 in  $\text{I}^-$ . The oxidation state of sulphur goes from -2 in  $\text{H}_2\text{S}$  to 0 in  $\text{S}_{(s)}$ . So, Iodine gets reduced and sulphur gets oxidised.

### Question 6

Based on the first law of thermodynamics, which of the following is correct?

- a) For an isothermal process,  $q = +w$
- b) For an isochoric process,  $\Delta U = -q$
- c) For an adiabatic process,  $\Delta U = -w$
- d) For a cyclic process,  $q = -w$
- e) None of these

**Correct Answer:** d) For a cyclic process,  $q = -w$

**Explanation:**

For the first law of thermodynamics, cyclic process  $q = -w$ . For an isothermal process,  $w = -q$ . For an adiabatic process,  $\Delta U = w$ , since  $q = 0$ .

### Question 7

The quantum number which describes the shape of the orbital is

- a) Principal quantum number
- b) Azimuthal quantum number
- c) Magnetic quantum number
- d) Angular quantum number
- e) Both b and d

**Correct Answer:** e) Both b and d

**Explanation:**

Azimuthal or angular quantum number describes the shapes of the orbital. Principal quantum number describes the size and energy of the orbital. Magnetic quantum number describes the orientation in space of a particular orbital.

**Question 8**

**Representative elements are those which belong to**

- a) s& d-block elements
- b) p& d-block elements
- c) s& p-block elements
- d) d& f-block elements
- e) s& f-block elements

**Correct Answer:** c) s & p-block elements

**Explanation:**

The p-block elements comprise those belonging to groups 13 to 18 and together with the s-block elements are called Representative Elements.

**Question 9**

**The conversion of methane to chloromethane in the presence of UV light is an example for**

- a) Electrophilic addition
- b) Elimination
- c) Nucleophilic substitution
- d) Free radical substitution
- e) Photochemical free radical reaction

**Correct Answer:** e) Photochemical free radical reaction

**Explanation:**

Free radical reactions are of two types, photochemical fission and thermal fission. The reaction, which takes place in presence of UV light is called photochemical fission reaction.

**Question 10**

**A mixture of nitrobenzene and benzene can be separated by using**

- a) Simple distillation
- b) Fractional distillation
- c) Steam distillation
- d) Filtration
- e) Crystallisation

**Correct Answer:** simple distillation

**Explanation:**

The liquids with boiling points widely apart (about 40K and above) can be purified by simple distillation, if they do not decompose under ordinary pressure. Nitrobenzene has a boiling point of 484K and benzene has a boiling point of 354K. So, it they can be separated using simple distillation.

**Question 11**

**Basic principle of crystallization is that solute should be soluble in a suitable solution at**

- a) Low temperature
- b) High temperature
- c) Room temperature
- d) Freezing temperature
- e) Either a or b

**Correct Answer:** b) High temperature

**Explanation:**

The solvent should be added little by little with constant stirring and heating till all the solute particles get dissolved in a solvent. Then filtration process has to be carried, followed by crystallization process.

**Question 12**

**Pick out the correct phrase(s) about the acidity of compounds.**

**I. Weaker the acid, smaller the value of  $K_a$ .**

**II. Stronger the acid, lesser the value of degree of hydrolysis**

**III.  $K_h = K_a / K_w$**

- a) I and II
- b) I and III
- c) I only
- d) I,II and III
- e) II and III

**Correct Answer:** a) I and II

**Explanation:**

The weaker the acid, the smaller is the value of  $K_a$  and greater the degree of hydrolysis. The hydrolysis constant  $K_h$  of the salt varies inversely as the dissociation constant  $K_a$  of the weak acid.

### Question 13

When 4g of glucose is dissolved in 250mL of hot water, its molarity will be

- a) 0.88 M
- b) 0.088 M
- c) 11.363 M
- d) 8.8 M
- e) 5.8 M

**Correct Answer:** b) 0.088 M

#### Explanation:

Molecular weight of glucose is 180 M

Number of moles of glucose in 4g is  $4 \text{ g}/180 \text{ g mol} = 0.022 \text{ mol}$ .

Convert the volume of solvent in litres  $250 \text{ mL} * (1 \text{ L}/1000 \text{ mL}) = 0.2501 \text{ L}$

Molarity = Mass/volume =  $0.022 \text{ mol}/0.2501 \text{ L} = 0.088 \text{ mol/L}$  or 0.088 M.

### Question 14

Example for monoclinic crystal structure is

- a) Rutile
- b) Rock salt
- c) Silica
- d) Gypsum
- e) Calcite

**Correct Answer:** d) Gypsum

#### Explanation:

Gypsum – monoclinic crystal structure, rutile – tetragonal, rock salt – cubic structure, silica – hexagonal, calcite – rhombohedral.

### Question 15

CO<sub>2</sub> filled in soft drinks is an example for

- a) Dalton's law
- b) Raoult's law
- c) Henry's law
- d) Colligative property
- e) None of these

**Correct Answer:** c) Henry's law

**Explanation:**

Henry's law states that the solubility of a gas in a liquid is directly proportional to the pressure of the gas.