

Chemistry  
Entrance  
Material  
for Grade  
11 to 12  
Key  
Answer

2018-2019

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## Chapter 1: The Condensed Phases of Matter

In all multiple choice questions, more than answer could be correct

### Section №: 1 Pure Substances

#### Concept №:

#### **1. Know where gaseous elements are located in the periodic table**

01. What are the elements that are normally found as gases?

H, N, O, F, Cl, and Nobel gas

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02. Where are these gaseous elements placed in the periodic table?

Top to the right

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#### **2. What the vapour pressure of a liquid depends upon**

03. What is the only factor that affects the vapour pressure?

Temperature

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#### **3. Know what a volatile liquid is**

04. A liquid is called volatile if:

[-A-] it burns spontaneously in air

[-B-] it reacts explosively with oxygen

[-C-] it readily evaporates at room temperature

[-D-] it boils when heated in air

#### **4. Effect of temperature on vapour pressure**

05. How does the vapour pressure of a liquid vary with temperature?

As T increase the vapor pressure increase.

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#### **5. When a liquid boils it absorbs heat at constant temperature**

06. When a liquid at its boiling point is heated, what happens to the temperature? What happens to the heat given to the liquid?

Liquid absorb heat and temperature stay constant

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#### **6. Liquid-gas phase change is endothermic**

07. When a liquid evaporates, it

[-A-] gives energy to the surroundings

[-B-] takes energy from the surroundings

[-C-] neither takes nor gives energy to the surroundings

08. Which of these equations is correct?

- a)  $\text{H}_2\text{O} (l) + 42 \text{ kJ} \rightarrow \text{H}_2\text{O} (g)$ .
- b)  $\text{H}_2\text{O} (g) \rightarrow \text{H}_2\text{O} (l) + 42 \text{ kJ}$ .
- c)  $\text{H}_2\text{O} (g) + 42 \text{ kJ} \rightarrow \text{H}_2\text{O} (l)$ .

### 7. Definition of molar heat of vaporization

09. Define the molar heat of vaporization?

The heat requires to change one mole of liquid to gas at constant temperature.

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### 8. Variation of molar heat of vaporization

10. Which of the following liquids has the lowest molar heat of vaporization? A

Which one has the highest molar heat of vaporization? E

Which one has the highest vapour pressure at its boiling point? A

Liquid	A	B	C	D	E
Boiling Point/ °C	-20	-15	0	10	20

11. Substances that have higher boiling points have \_\_\_\_\_ (higher/ lower) molar heat of vaporization.

12. Consider the following liquids with their boiling points: A (30°C), B (60°C), C (25°C).

- Which one of the liquids has the highest molar heat of vaporization? B
- Which one of the liquids has the lowest molar heat of vaporization? C
- Which of the liquids have the highest vapour pressure at their boiling points?

C

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13. Substances that have higher boiling points have \_\_\_\_\_ (higher/ lower) molar heat of vaporization.

### 9. Defining vapour pressure of a liquid at a fixed temperature

14. When a liquid is in contact with its vapour at equilibrium at a constant temperature, the pressure exerted by its vapour is called

- [-A-] the total pressure
- [-B-] the partial pressure of the liquid
- [-C-] the liquid pressure of the vapour
- [-D-] the vapour pressure of the liquid
- [-E-] the atmospheric pressure

15. Place some liquid water (in excess) in a flask at t°C and seal the flask. Wait until no more water can evaporate. Does the partial pressure of the water vapour in the flask depend upon:

[-A-] the amount of liquid water left in the flask? No

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[-B-] the volume of the flask? No

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[-C-] the temperature of the flask? Yes

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16. With a surrounding pressure of 760 mm Hg, water boils at 100°C and ethanol boils at 78.6°C. Which of the 2 compounds has higher vapour pressure at their boiling points?

Equal

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17. Experiments with many liquids lead us to the following generalization: As the **temperature** increases, the vapour pressure of the liquid will always increase.

**10. Properties of the boiling point**

18. At the boiling point:

[-A-] Can molecules escape from the surface of a liquid to enter the gas phase as vapour? Yes

[-B-] What is the relationship between the vapour pressure and the atmospheric pressure?

Directly

[-C-] Can bubbles of vapour form anywhere within the liquid? Yes

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**11. Know when a liquid boils**

19. In general, a liquid boils when

[-A-] its vapour pressure is 1 atmosphere

[-B-] its vapour pressure is 760 mm Hg

[-C-] its temperature is 100°C

**[-D-] its vapour pressure equals the surrounding pressure**

[-E-] bubbles form only on the sides of its container

**12. Recognize location where the boiling point of water is highest**

20. Where will the boiling point of water be the highest or the lowest?

[-A-] at 600 m altitude? \_\_\_\_\_

[-B-] at 1000 m altitude? \_\_\_\_\_

[-C-] at 1200 m altitude? the lowest

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[-D-] at sea level? The highest

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**13. Definition of the normal boiling point**

21. What is the normal boiling point of a liquid?

The temperature at which the vapor pressure of liquid is exactly one atm

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**14. Solid-liquid phase change is endothermic**

22. When a solid at its melting point is heated, what happens to the temperature? What happens to the heat given to the solid?

Heat absorbed and temperature stay constant

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23. State whether the following changes are endothermic or exothermic?

- Liquid into solid. Exothermic
- Liquid into Gas. Endothermic
- Gas into liquid. Exothermic
- Solid into liquid. Endothermic

24. Is the energy needed to change S-L smaller or greater than changing L-G? smaller

25. When a solid melts, it \_\_\_\_\_ (absorbs/ releases) energy from/to the surroundings.

**15. Molar heat of fusion is less than the molar heat of vaporization**

26. Is the molar heat of fusion less than the molar heat of vaporization?

yes

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27. If  $\text{H}_2\text{O} (l) + 42 \text{ KJ} \rightarrow \text{H}_2\text{O} (g)$ , which of these equations is **CORRECT**?

[-A-]  $\text{H}_2\text{O} (s) \rightarrow \text{H}_2\text{O} (l) + 42 \text{ KJ}$

[-B-]  $\text{H}_2\text{O} (s) + 6.0 \text{ KJ} \rightarrow \text{H}_2\text{O} (l)$

[-C-]  $\text{H}_2\text{O} (s) + 42 \text{ KJ} \rightarrow \text{H}_2\text{O} (l)$

[-D-]  $\text{H}_2\text{O} (l) + 42 \text{ KJ} \rightarrow \text{H}_2\text{O} (s)$

**16. Definition of molar heat of fusion**

28. What is the molar heat of fusion?

The heat requires changing one mole of solid to liquid at constant temperature.

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**17. Variation of molar heat of fusion with melting point**

29. In general, for pure substances, the higher the melting point is, the \_\_\_\_\_ (higher/ lower) is the energy required to melt one mole of it.

30. The melting points of five substances, in °C, are given in the following table:

SOLID	V	W	X	Y	Z
Melting Point (°C)	60	30	10	180	50

Based on this data *alone*, which of the above substances is *expected* to have the highest molar heat of fusion? Y

31. The temperature at the boiling point or melting point \_\_\_\_\_ (increases/ decreases/ stays the same).

**18. At the same temperature, average KE is the same in all states**

32. At the same temperature, the average kinetic energy of molecules in the solid, liquid and gaseous phases of a substance is \_\_\_\_\_ (the same/ different).

**19. At the same temperature gases have the highest potential and overall energy**

33. The potential energy of the particles is the \_\_\_\_\_ (highest/ lowest) in the gaseous state and \_\_\_\_\_ (highest/ lowest) in the solid state.

**21. What happens when a liquid in a closed bottle evaporates**

34. When some of the liquid in a closed bottle evaporates until no more can evaporate,  
[-A-] The remaining liquid continues to become cooler because the molecules continue to evaporate all the time.

[-B-] The liquid continues to cool down.

[-C-] The liquid may cool down initially, but then it will stay at the same temperature because the system has reached equilibrium.

[-D-] The remaining liquid becomes hotter because evaporation needs heat.

[-E-] None of the above

**Section №: 2 Solutions**

**Concept №:**

**1. A solution is a homogeneous solution**

35. Are all gaseous mixtures homogenous solutions? yes

**2. Recognize a solution**

36. What is a solution? A homogeneous mixture that contains more than one compound

37. Which of the following may not be classified as a solution?

[-A-] air

[-B-] ethanol mixed thoroughly with water

[-C-] a mixture of oil and water

[-D-] steel

[-E-] milk

38. Give examples of solid solutions. Alloy

**3. Effect of freezing or boiling salt water**

39. Which of the following observation(s) is/are *TRUE* about boiling and freezing a sample of pure water and another one of salt solution?

1. When cooling, both samples freeze at the same temperature .**F** \_\_\_\_\_

2. Heat some of each liquid until it boils, collect some of the vapours, and condense them. Both resulting liquids prove to be pure water. **T** \_\_\_\_\_

3. The freezing point of salt solution is higher than that of pure water.

**F** \_\_\_\_\_

40. How does a solid affect the boiling point and freezing point of a liquid in which it is dissolved?

1. The boiling point *drops*.

2. The freezing point *drops*.

3. The boiling point *increases*.

**4. A solution is heterogeneous with respect to change of phase**

41. What is meant by heterogeneous with respect to change of phase? Give an example.

A change of phase results in materials that are different from starting material

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**5. At the same pressure, BP and MP of a solution depends on composition**

42. At the same pressure, the boiling and melting points of a solution

[-A-] are always constant

[-B-] are different for the same composition

[-C-] are different for different compositions

43. Substances have sharp melting points when they are \_\_\_\_\_ (pure/ impure).

44. Why do solutions have varying boiling and melting points?

Because it depends on the percentage of the compositions.

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**Section №: 3 Separating Mixtures**

**Concept №:**

**1. Filtration: to separate heterogeneous mixture of solid in liquid**

45. To obtain dry sand and salt from a mixture of sand and salt we need to follow which of the following steps and in what order?

1. Add excess water to the mixture and stir.

2. Heat the solution to crystallize.

3. Filter, and allow the residue to dry.

4. Add excess alcohol to the mixture and stir.

1,3,2

**2. Selective solubility: to separate a mixture of two solids**

46. To separate salt and sugar from a salt-sugar mixture, we need to follow which of the following steps and in what order?

1. Add excess water to the mixture and stir.

2. Heat the filtrate on a water bath to evaporate alcohol safely. Then collect the sugar.

3. Filter, and allow the salt residue to dry.

4. Add excess alcohol to the mixture and stir.

4,3,2

**3. How to heat alcohol in a beaker**

47. It is required to heat a beaker containing some alcohol. How should this be done SAFELY?

By electrical heater or steam bath

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**4. Meaning of sublimation**

48. What does it mean to say that a substance sublimates?

Change from solid to gas without passing to liquid state

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49. Which mixture is easy to separate by sublimation?

[-A-] Salt + Sand

[-B-] Salt + Sugar

- [-C-] Salt + Ammonium chloride
- [-D-] Nitrogen liquid + Oxygen liquid
- [-E-] Ammonium chloride dissolved in water

### **6. Recognize mixture to be separated by distillation**

50. Which mixture is easy to separate by distillation?

- [-A-] Salt + Sand
- [-B-] Salt + Sugar
- [-C-] Salt + Ammonium chloride
- [-D-] Nitrogen liquid + Oxygen gas
- [-E-] Calcium chloride dissolved in water
- [-F-] Salt + Water
- [-G-] Sugar + Water

### **7. Recognize distillation apparatus**

51. Draw and label the distillation apparatus.



### **8. Recognize mixture to be separated by fractional distillation**

52. Which mixture is easy to separate by fractional distillation?

- [-A-] Salt + Sand
- [-B-] Salt + Sugar
- [-C-] Salt + Ammonium chloride
- [-D-] Nitrogen liquid + Oxygen liquid
- [-E-] Calcium chloride dissolved in water
- [-F-] Water + alcohol

### **10. Recognize mixture to be separated by a separatory funnel**

53. Which mixture is easy to separate by using a separatory funnel?

- [-A-] Salt + Sand
- [-B-] Water + Alcohol
- [-C-] Salt + Ammonium chloride
- [-D-] Nitrogen liquid + Oxygen liquid
- [-E-] Water + oil

### **11. Know the meaning of adsorption**

54. What is adsorption?

Molecule of certain gas and liquid tend to stick to the surface of certain solid

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### **12. Recognize mixture to be separated by adsorption**

55. Which mixture is easiest to separate into components by adsorption?

[-A-] Brewed tea

[-B-] Sea water

[-C-] Sand and salt

[-D-] Blue copper sulphate solution

[-E-] Yellow potassium chromate solution

### **13. Recognize good adsorbing materials**

56. Which of the following is a good adsorbing agent?

[-A-] Sponge

[-B-] Charcoal

[-C-] Sand

[-D-] Silica

[-E-] Filter paper

57. \_\_\_\_\_ (Sponge/ Charcoal/ Sand/ Silica/ Filter paper) is available as small sachets placed in leather and electronic items.

58. \_\_\_\_\_ (Sponge/ Charcoal/ Sand/ Silica/ Filter paper) can be placed in fridges to adsorb any offensive odor.

### **14. Recognize mixture to be separated by chromatography**

59. Which mixture is easiest to separate into components by chromatography?

[-A-] Water + Alcohol

[-B-] Sea water

[-C-] Green liquid obtained by squashing green leaves

[-D-] Blue copper sulphate solution

[-E-] Yellow potassium chromate solution

[-F-] Black ink

## **Section №: 4 Aqueous Solutions**

### **Concept №:**

#### **1. Know what aqueous solutions are**

60. What is an aqueous solution?

A solution in which the solvent is water

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#### **2. Know meaning of the term molar concentrations**

61. What is the molar concentration?

Number of moles of solute dissolved per L of solution

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**3. Concentration of a fraction of a given volume of solution**

62. 500 ml of 3.0 M  $\text{Na}_2\text{CO}_3$  solution is prepared in a flask. 300 ml of solution is poured out of the flask into a beaker. What is the concentration of the salt solution in the beaker?

3 M

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**4. How to make a 1.00 M salt solution**

63. Explain how you would prepare a 2.00 M NaCl solution. [Na = 23; Cl = 35.5]

117 g

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**5. Find number moles in solution given V and M**

64.  $0.15 \text{ dm}^3$  of 2.0 M NaOH solution is to be prepared in a flask. How many moles of NaOH are required?

0.3 mole

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65. How many moles of salt are needed to prepare  $750 \text{ cm}^3$  of a 2.5 M solution?

1.875 mole

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66. How many moles are needed to prepare 0.3 L of 2M HCl solution? [H = 1, Cl = 35.5]

0.6 mole

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**6. Find mass in solution given V and M**

67.  $0.50 \text{ dm}^3$  of 0.4 M NaOH solution is to be prepared in a flask. How many grams of NaOH are required? [Na = 23; O = 16; H = 1]

8 g

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68. What mass of HCl do you need to prepare 500ml of 2.5M solution? [H = 1, Cl = 35.5]

45.625 g

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**8. Find volume in solution given n and M**

69. A 4 M solution containing 0.5 mol of  $\text{KNO}_3$  is to be prepared in a flask. What is the volume of the flask required?

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0.125 L

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**9. Find molecular mass of X in solution given V, mass and M**

70. 2 dm<sup>3</sup> of a 1M solution contain 73 g of an acid X. What is the molecular mass of X?

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36.5 g

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**7. Find new concentration of diluted solution**

71. 400 cm<sup>3</sup> of a 0.40 M lithium hydroxide solution is poured into a clean volumetric 500 cm<sup>3</sup> flask. Distilled water is added to fill the flask up to the etched mark. What is the concentration of the salt solution in the flask?

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0.32 M

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72. 150 mL of 4M KCl solution was poured into a volumetric flask. Water was then added until the final volume is 1000 mL. What is the concentration of the resulting solution?

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0.6 M

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73. 340 mL of a 3 M HCl solution is prepared in a flask. If you add 160 mL of water to the above solution, what is the final concentration?

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2.04 M

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### **10. The meaning of a saturated solution**

74. What do chemists mean by the term 'saturated solution'?

A solution in which no more solute can be dissolved

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### **11. Meaning of 'solubility of a solid' in chemistry**

75. Define solubility.

It is affixed amount of a solute dissolved in a saturated solution at constant temperature.

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### **12. The meaning of the word 'soluble' in chemistry**

76. Which of the following is **CORRECT** concerning the terms 'soluble', 'slightly soluble', 'very slightly soluble' and 'negligible solubility'?

[-A-] **Soluble** if its solubility is more than 1.0 M

[-B-] **Slightly soluble** if its solubility is less than 1.0 M

[-C-] **Very slightly soluble** if its solubility is less than  $10^{-2}$  M

[-D-] **Insoluble** or of **negligible solubility** if its solubility is so low as to be of no interest to us, e.g. glass has negligible solubility in water

77. A substance is said to be soluble if its solubility is \_\_\_\_\_ (greater/ smaller) than 0.1 M.

## **Section №: 5 The Electrical Nature of Matter**

### **Concept №:**

#### **1. Know the basics of the electric model of atoms**

78. In a neutral atom, the number of protons is equal to the number of \_\_\_\_\_ (electron/ neutrons/ions).

79. What is a conductor?

A material where charged particle can flow (allow flow of electricity)

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80. What is an insulator?

A material where charged particle cannot flow (does not allow flow of electricity)

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81. According to our model of electricity, which of the following is **wrong**?

[-A-] Each electron carries a charge of  $-1$ .

[-B-] Each nucleus carries a charge of  $+1$ .

[-C-] If a neutral atom has 5 electrons going around it, then the charge on its nucleus is  $+5$  units.

[-D-] If a neutral atom loses 2 electrons the total charge on it becomes  $+2$  units.

[-E-] If a neutral atom gains 2 electrons the total charge on it becomes  $+2$  units.

82. What is the charge of 1 electron, 1 proton and 1 neutron?

E=-1, p=+1, n= 0

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83. Opposite charges \_\_\_\_\_ (repel/ attract) each other, while like charges (repel/ attract) each other.

**2. Know the direction of the electric current**

84. The flow of electricity inside the battery is from the \_\_\_\_\_ (positive/ negative) terminal to the \_\_\_\_\_ (positive/ negative) terminal.

85. The flow of electrons outside the battery (in the wires) is from the \_\_\_\_\_ (positive/ negative) terminal to the \_\_\_\_\_ (positive/ negative) terminal.

**3. Know how a van de Graaf generator generates charge**

86. A van de Graaf generator is an instrument that causes two bodies to become charged by

- [-A-] connecting them to a battery
- [-B-] connecting them to a dynamo
- [-C-] connecting them to an electric generator
- [-D-] causing between them chemical reactions
- [-E-] rubbing two objects together

**4. Know what an electrometer is**

87. An electrometer
- [-A-] creates electric energy
  - [-B-] creates electric charges
  - [-C-] detect electric charges
  - [-D-] causing chemical reactions between charges

**Section №: 6 Electrical Properties of Condensed Phases**

**Concept №:**

**1. Recognize aqueous solutions which conduct electric current**

88. Water is a \_\_\_\_\_ (poor/ good) conductor of electricity.

89. Which of the following liquids completes an electric circuit?

- [-A-] Milk
- [-B-] An aqueous solution of sodium chloride
- [-C-] An aqueous solution of sugar
- [-D-] distilled water

**2. Know what is an electric current**

90. What is an electric current?

Movement of electric charge

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### **3. When NaCl dissolves in water we have ions**

91. When NaCl dissolves in water, we have (identify the correct choices)

[-A-] sodium ions only, represented by  $\text{Na}^+(aq)$

[-B-] chloride ions only, represented by  $\text{Cl}^-(aq)$

[-C-] solid sodium chloride forming ions as follows:  $\text{NaCl}(s) \rightarrow \text{Na}^+(aq) + \text{Cl}^-(aq)$ .

### **4. Know what is an ion**

92. In aqueous solution: 1 mole of  $\text{NaCl}(s) \rightarrow$  1 mole  $\text{Na}^+$  + 1 mole  $\text{Cl}^-$

93. In aqueous solution: 1 mole of  $\text{CaCl}_2(s) \rightarrow$  1 mole  $\text{Ca}^+$  + 2 mole  $\text{Cl}$

94. Complete the following reaction:  $(\text{NH}_4)_2\text{SO}_4(aq) \rightarrow$  2 mole  $\text{NH}_4^+$  + 1 mole  $\text{SO}_4^{2-}$

### **5. Model to explain how current flows through an aqueous solution**

95. Which of the following points are involved in the model to explain how current flows through an aqueous solution of NaCl?

[-A-] Solid NaCl dissolves in water, forming charged particles  $\text{Na}^+(aq)$  and  $\text{Cl}^-(aq)$  that can move in the solution independently.

[-B-]  $\text{Na}^+(aq)$  ions (and all positive ions) are repelled away from the positive electrode and attracted towards the negative electrode.

[-C-]  $\text{Cl}^-(aq)$  ions are repelled away from the negative electrode and attracted towards the positive electrode.

96. In an ionic solution connected to a battery, all positive ions move in the \_\_\_\_\_ (same/ opposite) direction to current, while negative ions move in the \_\_\_\_\_ (same/ opposite) direction to current.

### **6. Conditions for an electric current to flow through a circuit**

97. What are the points necessary for an electric current to flow through an aqueous solution? In order for electricity to flow, the circuit should be \_\_\_\_\_ (closed/ opened).

### **7. Why $\text{CaCl}_2$ solution conducts current but sugar in water does not**

98. Why does aqueous  $\text{CaCl}_2$  solution conduct electricity but sugar in water does not?

Which of the following is a part of the explanation?

[-A-] Sugar solution in water forms only one type of ion: Sugar ( $aq$ ).

[-B-] Calcium chloride forms two types of ions:  $\text{CaCl}_2(s) \rightarrow \text{Ca}^{2+}(aq) + 2\text{Cl}^-(aq)$ .

[-C-] Calcium chloride provides  $\text{Ca}^+(aq)$  and  $\text{Cl}^-(aq)$ .

### **8. Know how many moles of ions one mole of $\text{AgNO}_3$ provides in water**

99. One mole of silver nitrate,  $\text{AgNO}_3$ , in water provides how many moles of ions?

[-A-] One mole of  $\text{Ag}^+(aq)$  and one mole of  $\text{N}^-$ .

[-B-] One mole of  $\text{Ag}^+(aq)$  and three moles of  $\text{NO}_3^-(aq)$ .

[-C-] One mole of  $\text{Ag}^+(aq)$  and four moles of negative ions ( $aq$ ).

[-D-] One mole of  $\text{Ag}^+(aq)$  and one mole of negative nitrate ions,  $\text{NO}_3^-(aq)$ .

[-E-] Five moles of ions.

### **9. Recognize that not all ionic solid are soluble in water**

100. Which solid is not soluble in water?

[-A-] Silver chloride, AgCl

[-B-] Silver nitrate, AgNO<sub>3</sub>

[-C-] Sodium chloride, NaCl

[-D-] Calcium chloride, CaCl<sub>2</sub>

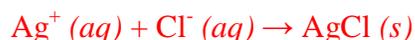
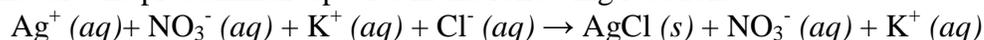
[-E-] Ammonium chloride, NH<sub>4</sub>Cl

### **10. Definition of precipitation**

101. The formation of solid from a solution is called precipitation

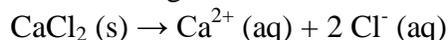
### **11. Know the meaning of 'predominant reacting species'**

102. What are the predominant species in the following reaction:



### **12. Balance ionic equations**

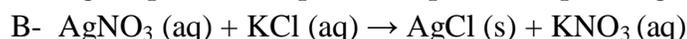
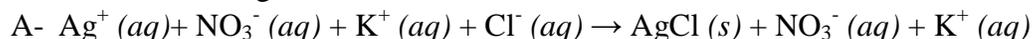
103. Is the charge conserved in the following reaction:



zero → +2 + - 2

### **13. Know three ways to write equations involving ions**

104. Consider the following reactions:



Which of the following reactions is an overall non-ionic reaction? B

Which of the following reactions is an overall ionic reaction? A

Which of the following reactions is a net ionic reaction? C

## **Section №: 8 Types of Solids**

### **Concept №:**

#### **1. Recognize properties of molecular solids**

105. Give examples on molecular compounds. Sugar

#### **2. Properties of an ionic solid, e.g. NaCl**

106. Give examples on ionic solids. NaCl

107. Ionic compounds have \_\_\_\_\_ (high/ low) boiling points while molecular compounds have \_\_\_\_\_ (high/ low) boiling points.

108. \_\_\_\_\_ is an example of an ionic compound at room temperature?

- 1 Sugar:  $C_6H_{12}O_6 (s)$
- 2  $CO_2 (g)$
- 3  **$NaCl (s)$**

109. Does molten salt, NaCl, conduct electricity? yes

### **3. Know what is an anion**

110. What is the charge of the anion?

Negative

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### **4. Know what is a cation**

111. What is the charge of the cation?

Positive

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### **5. Know symbols and charge of the given 10 cations and 10 anions**

112. Give the correct symbol of:

Silver ion:  $Ag^+$

Ammonium ion:  $NH_4^+$

Sulfate ion:  $SO_4^{2-}$

Carbonate ion:  $CO_3^{2-}$

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### **6. Name salts of the given 10 cations and 10 anions**

113. What is the name of:

$AgNO_3$ : silver nitrate

$CaCl_2$ : calcium chloride

$NaCl$ : sodium chloride

$BaSO_4$ : barium sulfate

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114. Which salt is named or written incorrectly?

[-A-]  $K_2Cr_2O_7$  is potassium dichromate

**[-B-]  $NH_4Cl$  is chloride ammonium**

[-C-] Lead sulphate is  $PbSO_4$

[-D-]  $K_2CO_3$  is potassium carbonate

[-E-] Barium hydroxide is  $Ba(OH)_2$

115. What is the chemical formula and the name of the compound formed between:

$Ba^{2+}$  and  $Cl^-$ :  $BaCl_2$  Barium chloride

$Ba^{2+}$  and  $SO_4^{2-}$ :  $BaSO_4$  Barium sulfate

$NH_4^+$  and  $SO_4^{2-}$ :  $NH_4SO_4$  Ammonium sulfate

---

### **7. Know an example of a metallic solid and a network solid**

116. Examples of metallic and network solids respectively are:

[-A-] copper and wax

[-B-] salt and sugar

[-C-] gold and charcoal

[-D-] sodium and diamond

[-E-] mercury and string

**117.** Atoms of metallic solids are strongly bonded to each other, so they have very \_\_\_\_\_  
(high/ low) melting and boiling points.

**118.** Atoms of network solids are strongly bonded to each other, so they have very \_\_\_\_\_  
(high/ low) melting and boiling points.

## Chapter 2: Structure of the Atom and the Periodic Table

In all multiple choice questions, more than answer could be correct

### Section №: 1 Structure of the Atom

#### Concept №:

#### 1. Contents of an atom (nucleus, electrons) and its size

01. Atoms have diameters in the order of \_\_\_\_\_ ( $10^{-10}$ /  $10^{-6}$ /  $10^{-5}$ ) m.

02. Atoms have \_\_\_\_\_ (nucleus/ electrons) around which \_\_\_\_\_ (nucleus/ electrons) move.

#### 2. Contents of the nucleus

03. The mass of the atom is concentrated in the \_\_\_\_\_ (nucleus/ electronic cloud), while the volume is occupied by the (nucleus/ **electronic cloud**).

04. The nucleus contains proton \_\_\_\_\_ and neutron \_\_\_\_\_, nucleons. \_\_\_\_\_ called the

05. What is the role of the neutrons? Bind nucleus together \_\_\_\_\_

#### 3. Common characteristics of nuclei of the same element

06. All nuclei of a particular element have the same number of proton \_\_\_\_\_

#### 4. How atoms form positive and negative ions

07. Atoms become negative ions by \_\_\_\_\_ (**gaining**/ losing) electrons.

08. Atoms become positive ions by \_\_\_\_\_ (gaining/ **losing**) electrons.

#### 5. When is energy absorbed/ released in ion formation

09. For which of the following processes will energy be absorbed?

- A- Separating an electron from an electron
- B- Separating an electron from a proton
- C- Separating a proton from a proton
- D- Removing an electron from a neutral atom**

10. Which of the following is/are **TRUE**?

- 1. Neutral atom + electron  $\rightarrow$  negative ion + Energy**
- 2. Neutral atom  $\rightarrow$  positive ion + electron + Energy**
- 3. Neutral atom + Energy  $\rightarrow$  positive ion + electron**

#### 6. Comparison of masses of protons, neutrons and electrons

11. Mass of proton is:

- A- Equal to the mass of electron

B- 1/1840 times the mass of electron

C- 1840 times the mass of electron

D- Smaller than the mass of electron

### **7. The nuclear model**

12. What are the subatomic particles?

Proton, neutron, electron

---

13. Fill in the following table:

Subatomic Particles	Mass	Charge
Electron	1/1840 amu	-
Proton	1 amu	+
Neutron	1 amu	0

### **8. What is meant by a stable nucleus**

14. When we say that a nucleus is stable, what do we mean?

Have the same number of electron as Nobel gas

---

### **10. What is meant by 'atomic diameter' in a crystalline solid**

15. What is the atomic diameter in a solid?

Distance between two nuclei

---

### **11. Atomic number**

16. What is the atomic number?

The same number of proton

---

### **12. Mass number**

17. What is the mass number?

Proton + neutron

---

### **13. Atomic and mass numbers**

18. Consider the nucleus  $^{16}_8\text{O}$ .

a) What is its atomic number (Z)? 8

b) What is its mass number (A)? 16

c) How many protons does it contain? 8

d) How many electrons does it contain? 8

e) How many neutrons does it contain? 8

f) How many nucleons does it contain? 16

19. Referring to symbols of atomic nuclei, the atomic number is written as a subscript at the \_\_\_\_\_ (upper/ lower) left of the symbol, and the mass number is written as a superscript at the \_\_\_\_\_ (upper/ lower) left of the symbol.

**15. Recognize a symbol that defines a nucleus instead of the whole atom**

20. What does  ${}^A_ZX$  represent?

X: symbol of element                      A: atomic mass                      Z: atomic number

---

21. What does  ${}^{12}_6C$  represent?

C: symbol of element                      16: atomic mass                      6: atomic number

---

**17. Know what deuterium is**

22. What is deuterium?

Isotope of hydrogen which has one proton and one neutron

---

**18. Know what isotopes are**

23. Isotopes are nuclei having the same **proton** but different **neutron**.

**19. Know that chemical properties are determined by Z**

24. During chemical reactions, only \_\_\_\_\_ (**electrons**/ protons/ neutrons) are involved, while \_\_\_\_\_ (electrons/ protons/ **neutrons**) and \_\_\_\_\_ (electrons/ **protons**/ neutrons) remain intact.

25. **electron** \_\_\_\_\_ and **proton** \_\_\_\_\_ are responsible for the chemical properties of an element.

**20. Find average atomic mass from ratio of isotopes**

26. Chlorine in nature consists of 75.4% of chlorine-35 and 24.6% of chlorine-37. Find the average molar mass of chlorine.

35.5 amu

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## Section №: 2 The Periodic Table

### Concept №:

#### 1. Recognize that in a row of the periodic table elements have consecutive Z

27. In the periodic table, elements are placed sequentially in rows according to the \_\_\_\_\_ (atomic number/ mass number) from the left to right.

#### 2. Recognize what 'row' and 'group' of the periodic table mean

28. Elements belonging to the same row means that they belong to the same \_\_\_\_\_ (period/group).

29. Elements belonging to the same column mean that they belong to the same \_\_\_\_\_ (period/ group).

30. Elements belonging to the same group have equal number of \_\_\_\_\_ (electrons/ protons/ neutrons) in the last energy level.

31. If a neutral atom has 7 electrons, to what group and period does it belong?

Group 5 period 2

---

32. A neutral atom of Oxygen ( ${}_8\text{O}$ ) has 8 electrons around the nucleus. To what group does oxygen belong?

Group 6

---

33. A neutral atom of Sulphur ( ${}_{16}\text{S}$ ) has 16 electrons around the nucleus. To what group does sulphur belong?

Group 6

---

34. If a neutral atom has an atomic number of 12. To what group and period does it belong?

Group 2 period 3

---

#### 3. Recognize where 'metals' and 'non metals' are in the periodic table

35. In the periodic table, metals are placed on the left \_\_\_\_\_ and non-metals are present on the right \_\_\_\_\_.

#### 4. Transition metals: more than one charged ion, form colored compounds

36. Transition elements form \_\_\_\_\_ (colored/non-colored) compounds and more than one charged \_\_\_\_\_ (ions/atoms/molecules).

37. Elements located between group 2 and group 3 in the periodic table are called \_\_\_\_\_ (alkali metals/ halogens/ noble gases/ **transition elements**)

#### 5. Advantage of arranging elements in groups (families)

38. In the periodic table,  
[-A-] Elements on the right side are metals.

[-B-] Elements of group 7 can lose 1 electron and become stable

[-C-] Elements of group 1 can share 1 pair of electrons and become stable.

[-D-] Elements of groups 1, 2 and 3 lose electrons while elements of groups 4, 5, 6 and 7 can either gain or share electrons.

39. Fill in the following table:

	Atomic Number	Subatomic Particles			Mass Number
		Protons	Electrons	Neutrons	
Calcium ion: $\text{Ca}^{2+}$	20	20	18	20	40
Oxygen ion: $\text{O}^{2-}$	8	8	10	8	16
Neon: <b>Ne</b>	10	10	10	10	20
Bromine: <b>Br</b>	35	35	35	45	80
Aluminum ion: $\text{Al}^{3+}$	13	13	10	14	27
Chloride ion: $\text{Cl}^-$	17	17	18	18	35
Barium: <b>Ba</b>	56	56	56	81	137

### Section №: 3 The Simplest Chemical Family- The Noble Gases

#### Concept №:

#### 1. Variation of the BP and MP of noble gases with Z

40. Give examples of inert or noble gases? He, Ne, Ar

41. In noble gases, as the atomic number increases the boiling point increase

#### 2. Know that the electron arrangements of 2, 10, 18, 36 are stable

42. What electron arrangement around a nucleus makes the atom or ion stable?

2, 10, 18, 36

2, 10, 18, 26

#### 3. Know that helium, Z = 2, is an unreactive monoatomic gas

43. Which property of helium,  ${}^4_2\text{He}$ , is *INCORRECT*?

[-A-] It has the lowest boiling point among all elements.

- [-B-] It has a mass of 4 amu and 2 protons.  
[-C-] It has 10 electrons around its nucleus.  
[-D-] It is an inert gas.

44. Helium has the \_\_\_\_\_ (lowest/ highest) boiling points among all other elements.

**4. Ne, Ar, Kr, Xe, Rn: Monoatomic gases, unreactive, form unstable compounds**

45. Noble gases are called 'inert' because they are \_\_\_\_\_ (reactive/ unreactive).

**5. NaCl is stable because its ions have noble gas configurations**

46. NaCl is stable because Na<sup>+</sup> ion has 10 electrons around it while Cl<sup>-</sup> ion has 18 electrons around it.

**Section №: 4 The Alkali Metals**

**Concept №:**

**1. Properties of alkali metals**

47. Give examples on alkali metals.  
Li, Na, K

---

48. Alkali metals reacts by \_\_\_\_\_ (losing/gaining) 1 electron and forms a + \_\_\_\_\_ charged ions.

49. Alkali metals belong to group 1 because they last energy level 1 electron in the

50. Elements in groups I, II and III \_\_\_\_\_ (gain/ lose) electrons while elements in groups IV, V, VI and VII \_\_\_\_\_ (gain/ lose) electrons.

51. Alkali metals such as Li, Na, and K should be kept under kerosene because they are

Very reactive

---

**2. Explanation of electrical conductivity of metals**

52. Scientists explain the electrical conductivity of metals by:

[-A-] the presence of electrons in the crystal that are loose

[-B-] electrons that can move throughout the metallic crystal without specific attachment to particular atoms

[-C-] the ease of freeing one electron per atom

[-D-] the presence of positive M<sup>+</sup> ions in the metallic object that can move easily from one end to the other

[-E-] saying that all metals conduct electricity

**3. Know trend in Boiling points and Melting points of Alkali metals**

53. In alkali metals, as the atomic number increases the boiling point decrease.

**5. Meaning of a stable compound in chemistry**

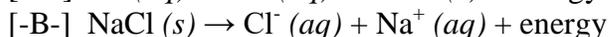
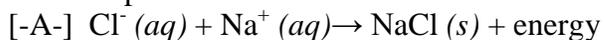
54. In chemistry, a compound is said to be stable if it has a relatively \_\_\_\_\_ (low/ high) potential energy.

**6. Know what happens when an ionic bond takes place**

55. If an ionic bond forms between two atoms; then the result is two ions: + \_\_\_\_\_ ion and - \_\_\_\_\_ ion.

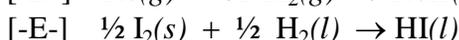
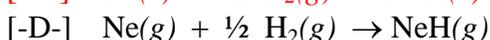
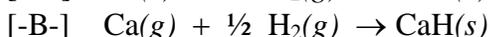
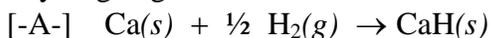
**7. Reactions of the alkali metals with chlorine**

56. Which represents the reaction of chlorine with an alkali metal?



**9. Action of the alkali metals on hydrogen**

57. Which of the following equations representing the reaction of an alkali metal and hydrogen gas is **CORRECT**?



**11. Test for  $\text{Li}^+$ ,  $\text{Na}^+$  and  $\text{K}^+$**

58. The salts of sodium are distinguishable by flame tests. What is the color of the flame produced?

Orange

---

59. The salts of potassium are distinguishable by flame tests. What is the color of the flame produced?

Red

---

60. The salts of lithium are distinguishable by flame tests. What is the color of the flame produced?

Violet

---

**Section №: 5 The Halogens**

**Concept №:**

**1. F, Cl, Br, I At are called the halogens or group 7 elements**

61. Fluorine, chlorine, bromine, iodine and astatine are halogens. These elements have one less electron than does its neighboring noble gas. All these elements are found in group \_\_\_\_\_ (I / II / III / **VII** / VIII).

**2. State of the halogens under normal conditions**

62. Under room temperature and pressure, which is **TRUE** about F, Cl, Br, and I?

1. Fluorine and chlorine are gases, bromine is a liquid and iodine is solid.

2. Fluorine and chlorine are gases, and the rest are solids.

3. They are all gases.

### **3. Know what happens when a covalent bond forms**

63. When a covalent bond is formed, one atom \_\_\_\_\_ (shares/ gains/ loses) electrons with another atom.

### **4. Differences between covalent and ionic bonding**

64. What is the main difference between an ionic bond and a covalent bond?

Ionic lose and gain electrons while covalent share electrons

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### **5. F<sup>-</sup>, Ne and Na<sup>+</sup> are isoelectronic: Know why F<sup>-</sup> is largest, Na<sup>+</sup> is smallest**

65. F<sup>-</sup>, Ne and Na<sup>+</sup> are isoelectronic. Which is the smallest and why?

[-A-] F<sup>-</sup> is the smallest because it has one more electron than Ne and two more than Na<sup>+</sup>.

[-B-] Na<sup>+</sup> is the smallest because it has one more electron than Ne and two more than F<sup>-</sup>.

[-C-] Na<sup>+</sup> is the smallest because it has one more neutron in the nucleus than Ne and two more than F<sup>-</sup>.

[-D-] F<sup>-</sup> is the smallest because it has one more proton than Ne and two more than Na<sup>+</sup>.

[-E-] Na<sup>+</sup> is the smallest because it has one more proton in the nucleus than Ne and two more than F<sup>-</sup>.

### **6. Reaction of the alkali metals with halogens**

66. Which of the following represents the reaction of a halogen with an alkali metal?

[-A-]  $K(s) + \frac{1}{2} Br_2(l) \rightarrow KBr(s)$ .

[-B-]  $Ca(s) + 2I_2(s) \rightarrow CaI_2(s)$ .

[-C-]  $Br^- + Na^+ \rightarrow NaBr(s) + \text{energy}$ .

[-D-]  $LiF(s) \rightarrow F^- + Li^+ + \text{energy}$ .

[-E-]  $NaF(s) \rightarrow Na^+(aq) + F^-(aq)$ .

67. Which represents the reaction of alkali metal with a halogen?

[-A-]  $F^-(aq) + Na^+(aq) \rightarrow NaF(s) + \text{energy}$

[-B-]  $NaF(s) \rightarrow F^-(aq) + Na^+(aq) + \text{energy}$

[-C-]  $Na(s) + \frac{1}{2} Br_2(l) \rightarrow NaBr(s) + \text{energy}$

[-D-]  $NaF(s) \rightarrow Na^+(aq) + F^-(aq)$

### **7. Reactions of halogens with hydrogen: Equation and Condition**

68. Which of these reactions take place at room temperature?

[-A-]  $H_2(g) + F_2(g) \rightarrow 2HF(g) + \text{energy}$ .

[-B-]  $H_2(g) + Cl_2(g) \rightarrow 2HCl(g) + \text{energy}$ .

[-C-]  $H_2(g) + Br_2(l) \rightarrow 2HBr(g) + \text{energy}$ .

[-D-]  $H_2(g) + I_2(s) \rightarrow 2HI(g) + \text{energy}$ .

[-E-] None, because the molecules are stable and energy is needed to break some bonds to start the reaction.

69. Chlorine reacts explosively with hydrogen when a spark is introduced? Which of the following is **TRUE**?

[-A-] The equation is  $\text{H}_2(g) + \text{Cl}_2(g) \rightarrow 2\text{HCl}(g) + \text{energy}$

[-B-] The equation is  $\text{H}_2(g) + \text{Cl}_2(g) + \text{energy} \rightarrow 2\text{HCl}(g)$

### **8. Know that halogens react by gaining or by sharing**

70. The halogen groups (Group 7 elements) may react to acquire noble gas structure by

Lose or share electrons

---

### **9. Know test for halide ions**

71. When silver nitrate ( $\text{AgNO}_3$ ) is added to solution of sodium chloride ( $\text{NaCl}$ ), sodium bromide ( $\text{NaBr}$ ) and sodium iodide ( $\text{NaI}$ ), we will observe the following respectively

[-A-] yellow, white and cream precipitates will form

[-B-] white, cream and yellow precipitates will form

[-C-] cream, white and yellow precipitates will form

[-D-] white, yellow and cream precipitates will form

### **10. HX are gaseous molecules that dissolve in $\text{H}_2\text{O}$ giving $\text{H}^+$ (aq) ions**

72. Hydrogen halides are \_\_\_\_\_ (gases/ solids/ liquids) at room temperature. They dissolve in water to produce a(n) \_\_\_\_\_ (acid/ base) releasing hydrogen ions and halide ions.

### **11. Know that a halogen replaces a halide ion in this order: $\text{F} > \text{Cl} > \text{Br} > \text{I}$**

73. Given a solution of  $\text{NaBr}$  in water. Which of the following is **TRUE**?

[-A-] If  $\text{I}_2$  is added, bromine will be released.

[-B-] If  $\text{Cl}_2$  is added, bromine will be released.

[-C-] If  $\text{I}_2$  is added, bromide ion will be formed in solution.

[-D-] If  $\text{Cl}_2$  is added, no reaction takes place.

[-E-] None of the above

## **Section №: 6 Hydrogen- A Family by Itself**

### **Concept №:**

#### **1. Properties of hydrogen under normal conditions**

74. Under room temperature and pressure, which is **TRUE** about hydrogen?

A. It is a diatomic gas

B. It has a low melting and boiling points.

C. It has the lowest boiling point among all elements.

D. It has the second lowest boiling point among all elements.

#### **2. Reaction of hydrogen with alkali metals; properties of NaH**

75. Which is **TRUE** about the reaction of sodium with hydrogen?

1 It reacts spontaneously according to the reaction  $\text{Na}(s) + \frac{1}{2}\text{H}_2(g) \rightarrow \text{NaH}(s)$

2 It reacts only with heating:  $\text{Na}(s) + \frac{1}{2}\text{H}_2(g) \rightarrow \text{NaH}(s)$

- 3 The product formed dissolves silently in water.
- 4 The product formed effervesces in water.
- 5 The product reacts with water:  $\text{NaH (s)} + \text{H}_2\text{O (l)} \rightarrow \text{H}_2 \text{(g)} + \text{Na}^+ \text{(aq)} + \text{OH}^- \text{(aq)}$

### **3. Reaction of hydrogen with chlorine**

76. Which is **TRUE** about the reaction of chlorine with hydrogen when a spark is introduced?
- 1 The equation is  $\text{H}_2 \text{(g)} + \text{Cl}_2 \text{(g)} \rightarrow 2\text{HCl (g)} + \text{energy}$
  - 2 The product is an ionic compound.
  - 3 The product dissolves in water to give a base.
  - 4 The product is a molecular compound.
  - 5 The product dissolves in water to give an acid.
  - 6 The equation is  $\text{H}_2 \text{(g)} + \frac{1}{2} \text{Cl}_2 \text{(g)} \rightarrow \text{HCl (g)}$
  - 7 The product dissolves in water to give an ionic solution.

### **Section №: 7 The Third-Row Elements**

#### **Concept №:**

#### **1. Properties of the 3<sup>rd</sup> row: Z, A, MP, type of solid**

77. Which is **TRUE** about the third row elements?
- 1 They have consecutive atomic numbers, increasing from left to right.
  - 2 They have decreasing mass numbers from left to right.
  - 3 The elements to the left are metallic solids.
  - 4 The elements to the left are molecular solids.
  - 5 Silicon is the only network solid in the period.
  - 6 The melting and boiling points increase then decrease as we go from left to right.

#### **2. Hydrides of the third row: formulae and type of bonding**

78. List the chemical formula of hydrides with the third row elements.

NAH, MgH<sub>2</sub> AlH<sub>3</sub>

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79. Which is **TRUE** about hydrides of the third row elements?
- [-A-] Sodium hydride is a molecular compound. [<sub>11</sub>Na, <sub>1</sub>H]
- [-B-] The chemical formula of Magnesium hydride is MgH<sub>2</sub>. [<sub>12</sub>Mg, <sub>1</sub>H]
- [-C-] Sulfur reacts with hydrogen to produce H<sub>4</sub>S. [<sub>16</sub>S, <sub>1</sub>H]
- [-D-] Three hydrogen atoms react with one chlorine atom to form H<sub>3</sub>Cl compound.  
[<sub>1</sub>H, <sub>17</sub>Cl]

#### **3. Elements of the third row that can make either ionic or covalent bonds**

80. Which is **TRUE** about these elements of the third row?
- [-A-] Sodium (<sub>11</sub>Na) can react by sharing an electron (e.g. with chlorine).
- [-B-] A chlorine atom (<sub>17</sub>Cl) reacts either by forming two ionic bonds or by forming three covalent bonds.
- [-C-] Magnesium (<sub>12</sub>Mg) reacts by losing two electrons per atom, thus making two ionic bonds (e.g. MgCl<sub>2</sub>).
- [-D-] Sulphur (<sub>16</sub>S) can react by losing two electrons.

#### **4. The chlorides of the third row: formulae and type of bonding**

81. Which is **TRUE** about chlorides of the third row elements?

[-A-] Aluminum reacts with chlorine to form a covalent bond. [<sub>13</sub>Al, <sub>17</sub>Cl]

[-B-] Silicon chloride has a formula SiCl<sub>4</sub>, and it is an ionic compound. [<sub>14</sub>Si, <sub>17</sub>Cl]

[-C-] Magnesium chloride (MgCl<sub>2</sub>) is a covalent compound. [<sub>12</sub>Mg, <sub>17</sub>Cl]

[-D-] Sodium chloride is an ionic solid. [<sub>11</sub>Na, <sub>17</sub>Cl]

#### **5. The oxides of the third row: formulae and type of bonding**

82. What is the formula of the oxide of aluminum? Al<sub>2</sub>O<sub>3</sub>

#### **6. How and why elements of Period 3 form bonds**

83. The following conclusions are drawn for the formation of bonds by elements of Period 3. Which of the following is **TRUE**?

1. Elements of group 5 react by losing three electrons.

2. Elements of group 7 react by gaining a single electron or by sharing one pair of electron to form one covalent bond.

3. Elements of group 6 react by losing two electrons.

### **Section №: 8 The Periodic Table: Chemical Reactivity**

#### **Concept №:**

#### **1. How the periodic table helps us predict chemical activity**

84. In the periodic table,

[-A-] elements grouped in a vertical column have similar chemical properties

[-B-] general statements can be made about the chemistry of elements in one group

[-C-] the formulas of compounds and the nature of bonds that hold the atoms together can be predicted from the position of these atoms in the periodic table

[-D-] elements in one horizontal row react to obtain an electron arrangement similar to the noble gas at the end of the row

[-E-] elements towards the lower left corner tend to be metal

## Chapter 3: Energy Effects in Chemical Reactions

In all multiple choice questions, more than answer could be correct

### Section №: 1 Heat and Chemical Reactions

#### Concept №:

#### 2. Know that the symbol H refers to the 'heat content' of a substance

01. The symbol H refers to the:

**[-A-] heat content of a substance**

[-B-] sum of heat contents of reactants and products

[-C-] sum of the heat contents of reactants

[-D-] sum of the heat contents of products

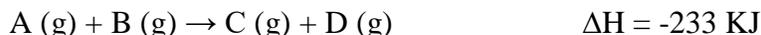
[-E-] difference of the heat contents of reactants and products

#### 3. Know that the symbol ( $\Delta$ )H refers to the 'increase' in heat content

02. For any reaction,  $\Delta H = \underline{H_{\text{product}} - H_{\text{reactant}}}$

#### 4. Write an expression for ( $\Delta$ )H for a given reaction

03. Suppose heat of contents per mole of A, B, C & D are respectively the following:  $H_A$ ,  $H_B$ ,  $H_C$  &  $H_D$ .



What is  $\Delta H$  in terms of  $H_A$ ,  $H_B$ ,  $H_C$  &  $H_D$ ?

$$\Delta H = (H_C + H_D) - (H_A + H_B)$$

#### 5. Recognize endothermic reaction written in ( $\Delta$ )H notation or otherwise

04. Which of the following reactions is *NOT* an endothermic reaction?

[-A-]  $\text{NH}_3(g) \rightarrow \frac{1}{2}\text{N}_2(g) + \frac{3}{2}\text{H}_2(g)$   $\Delta H = +46.0 \text{ KJ}$

[-B-]  $\frac{1}{2}\text{N}_2(g) + \text{O}_2(g) \rightarrow \text{NO}(g)$   $\Delta H = +90.4 \text{ KJ}$

**[-C-]  $\text{H}_2(g) + \frac{1}{2}\text{O}_2(g) \rightarrow \text{H}_2\text{O}(g)$   $\Delta H = -242 \text{ KJ}$**

05. Identify the endothermic reactions in the following:

[-A-]  $\text{CH}_4(s) + 2\text{O}_2(g) \rightarrow \text{CO}_2(g) + 2\text{H}_2\text{O}(l)$   $\Delta H = -890 \text{ kJ}$

[-B-]  $4\text{NH}_3(g) + 5\text{O}_2(g) \rightarrow 4\text{NO}(g) + 6\text{H}_2\text{O}(l)$   $\Delta H = -1169 \text{ kJ}$

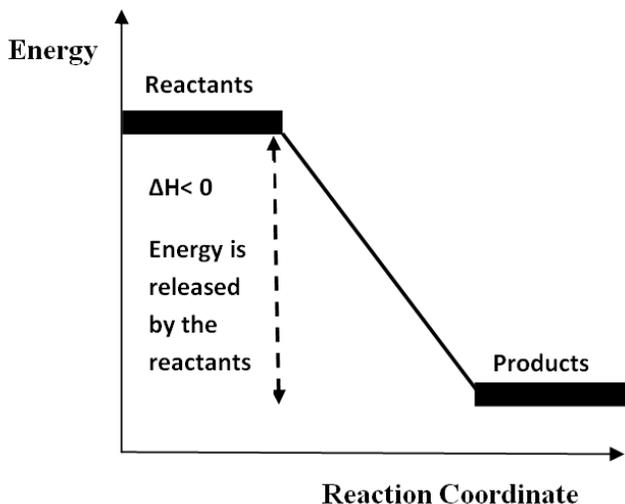
**[-B-]  $\frac{1}{2}\text{N}_2(g) + \text{O}_2(g) \rightarrow \text{NO}(g)$   $\Delta H = +90.4 \text{ KJ}$**

06. If  $\Delta H$  of a reaction is negative, then the reaction is exothermic and the products have

less potential energy than the reactants.

07. Is the following energy diagram showing an exothermic or endothermic reaction?

Exothermic



**6. Know the statement of Hess's Law**

08. Hess's law states that: The heat involved in a chemical reaction whether absorbed or released \_\_\_\_\_ (depends/ is **independent**) of the path followed and \_\_\_\_\_ (**depends/** is independent) only on the initial reactants and final products.

**7. Know the statement of bond energy.**

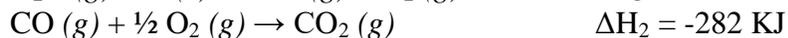
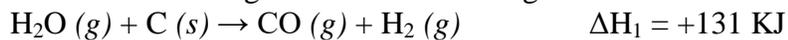
09. Define the term bond energy.

Heat required to break one mole of molecule

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**10. Determination of the heat of reaction**

10. The heat change  $\Delta H$  of the following overall reaction is:

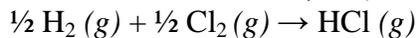


Overall Reaction:



**-393 KJ**

11. Using bond enthalpies, calculate the heat of reaction,  $\Delta H$ , for:



Given bond enthalpies: H-H: 436 KJ; H-Cl: 433 KJ; Cl-Cl: 243 KJ

**246 KJ**

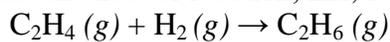
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12. Using bond enthalpies, calculate the heat of reaction,  $\Delta H$ , for:



Given bond enthalpies: H-H: 436 KJ; C-C: 348 KJ; C=C: 614KJ; C-H: 413KJ

-124 KJ

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**11. Know the meaning of the term 'calorimetry'**

13. What is calorimetry? It is:

[-A-] measuring reaction heats by observing changes in color

[-B-] using a calorie meter to measure calories

[-C-] determining the rate of reaction by measuring how quickly the temperature rises

**[-D-] the measurement of reaction heats**

[-E-] the measurement of heat content of a compound

**12. Know that a calorimeter is used to determine  $(\Delta)H$  at constant V**

14. Calorimeter is used to determine  $(\Delta)H$  at constant V

.

**13. Solving problems in calorimetry  $Q = mc\Delta T$  and  $\Delta H = Q/n$ .**

15. To change the temperature of a calorimeter and the water it contains by  $1^\circ\text{C}$  requires 10KJ. Find the heat of combustion per mole  $\text{C}_2\text{H}_6$  if 10g of  $\text{C}_2\text{H}_6 (g)$  causes a temperature rise of  $5.6^\circ\text{C}$  in the calorimeter. [C=12; H=1]

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16. To change the temperature of a calorimeter and the water it contains by  $1^\circ\text{C}$  requires 7 KJ. Find the heat of combustion per mole  $\text{C}_4\text{H}_{10}$  if 11.6g of  $\text{C}_4\text{H}_{10} (g)$  causes a temperature rise of  $7.3^\circ\text{C}$  in the calorimeter. [C=12; H=1]

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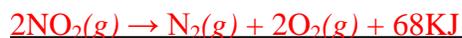
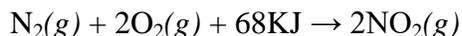
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**14. Recognize different formats of expressing heat of reaction**

17. How can you rewrite the following equation expressing  $\Delta H$  as per mole Fe (s)?

**15. Recognizing the reverse of an equation**

18. What is the reverse of the following equation?



19. When the reverse of an equation is written, the energy involved is inversed. The reverse of an exothermic reaction is endothermic.

**16. Given the heats of formation calculate the heat of reaction**

20. Calculate the heat of change of each of the following reactions by using the table below:

Substance	Heat Content (KJ)
H <sub>2</sub> O (l)	-286
CaO (s)	-1000
CaCO <sub>3</sub> (s)	-1440
CO (g)	-110
SO <sub>3</sub> (g)	-396

Substance	Heat Content (KJ)
CO <sub>2</sub> (g)	-393
C <sub>6</sub> H <sub>6</sub> (l)	49
NO <sub>2</sub> (g)	34
N <sub>2</sub> O <sub>4</sub> (g)	-43
SO <sub>2</sub> (g)	-297



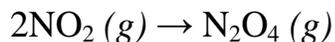
$$\Delta H = \underline{47 \text{ KJ}}$$

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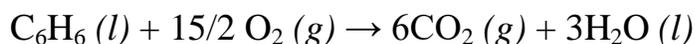
$$\Delta H = \underline{-99 \text{ KJ}}$$

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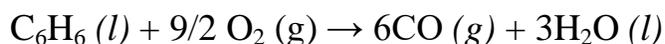
$$\Delta H = \underline{-111 \text{ KJ}}$$

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$$\Delta H = \underline{-3265 \text{ KJ}}$$

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$$\Delta H = \underline{-1567 \text{ KJ}}$$

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### Section №: 3 The Energy Stored in a Nucleus

#### Concept №:

#### **1. A positron has the same mass as an electron but has a charge of 1+**

21. What is a positron?

[-A-] It is a particle that forms a neutral atom with one  $\beta$  particle.

**[-B-] It is as massive as an electron but with a positive charge.**

[-C-] It is the nucleus of a hydrogen atom.

[-D-] It is the nucleus of helium atom.

[-E-] It has a mass of 2 and a charge of +4.

#### **2. Know that an alpha particle is the nucleus of a helium atom**

22. What is an  $\alpha$ -particle?

[-A-] It is a particle that forms a neutral atom with one  $\beta$  particle.

[-B-] It is an electron with a positive charge.

[-C-] It is the nucleus of a hydrogen atom.

**[-D-] It is the nucleus of a helium atom.**

[-E-] It has a mass of 2 and a charge of +4.

#### **3. Relative magnitude of heat involved in chemical and nuclear changes**

23. Which of the following is **CORRECT** about the relative magnitude of the heat involved in nuclear and chemical changes?

[-A-] Nuclear changes usually involve energies of tens of KJ/mole.

[-B-] Chemical reactions usually involve energies of tens of KJ/mole.

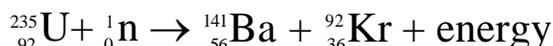
[-C-] Chemical reactions usually involve energies of about a 1000 KJ/mole.

[-D-] Chemical reactions usually involve energies of several million KJ/ mole.

**[-E-] Nuclear reactions usually involve energies of tens of millions of KJ/mole.**

#### **4. Find the missing particles(s) in a nuclear reaction**

24. How can you balance the following reaction?



[-A-] three neutrons are added to the left hand side.

[-B-] three protons should be added to the right hand side.

[-C-] three protons should be added to the right hand side.

[-D-] four hydrogen atoms should be added to the right hand side.

**[-E-] three neutrons should be added to the right hand side.**

### **5. Recognize nuclear fission reaction**

25. Which of the following is a nuclear fission reaction?

- [-A-]  ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$ .
- [-B-]  $\text{UF}_6(l) \rightarrow \text{UF}_6(g)$ .
- [-C-]  $\text{C}(s) + \text{O}_2(g) \rightarrow \text{CO}_2(g)$ .
- [-D-]  ${}_{94}\text{Pu} + {}^1_0\text{n} \rightarrow {}_{39}\text{Y} + {}_{55}\text{Cs} + 3$

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### **6. Recognize nuclear fusion reaction**

26. Which of the following is a nuclear fusion reaction?

- [-A-]  ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$ .
- [-B-]  $\text{UF}_6(l) \rightarrow \text{UF}_6(g)$ .
- [-C-]  $\text{C}(s) + \text{O}_2(g) \rightarrow \text{CO}_2(g)$ .
- [-D-]  ${}^{239}_{94}\text{Pu} + {}^1_0\text{n} \rightarrow {}^{91}_{39}\text{Y} + {}^{146}_{55}\text{Cs} + 3$

### **7. Charge and number of nucleons are conserved in nuclear reactions**

27. Which of the following is conserved in nuclear reactions?

- [-A-] Charge
- [-B-] Atoms
- [-C-] Number of nucleons

### **9. Mass lost in nuclear reactions changes to energy according to $E = mc^2$**

28. In nuclear reactions, the mass will be lost and transformed into energy according to

$$E = mc^2.$$

### **10. Know what nuclear reaction is, and that it changes mass to energy**

29. In nuclear fusion reactions:

- [-A-] a large nucleus splits into smaller nuclei.
- [-B-] two nuclei come together to form a larger nucleus.
- [-C-] is exemplified by  ${}^1_1\text{H} + {}^1_1\text{H} \rightarrow {}^2_2\text{He} + {}^1_0\text{n} + \text{energy}$
- [-D-] is exemplified by  ${}^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow {}^{141}_{56}\text{Ba} + {}^{92}_{36}\text{Kr} + 3 {}^1_0\text{n} + \text{energy}$
- [-E-] the mass lost is related to energy

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