Chemistry Entrance Material for Grade 10 to 11 Key Answer

2018-2019

Chapter 1: Laboratory Skills and Techniques

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

Section №: 1 Safety
Rules Concept №:

1. <u>Know the laboratory safety rules</u>

01. Which of the following statement(s) about the laboratory safety rules is ***TRUE*** or ***FALSE***?

a- Listen carefully to instructions: _____T_____

b- Wear safety glasses sometimes: ____F_____

c- Try your own experiment without permission: _____F_____

d- Do not smell a gas except with a great care: _____T_____

2. <u>Know the warning labels on containers of chemicals</u>

02. Label the following warnings and hazard labels.


flammable


Harmful


corrosive


Oxidant


Toxic


Explosive

Section №: 2 Chemical Apparatus
Concept №:

1. <u>Recognize the uses of some chemical apparatus</u>

03. Match each chemical apparatus with its corresponding use:

1. Pipette B
2. Measuring cylinder H
3. Thermometer E
4. Test tube D
5. Funnel A
6. Wire gauze G

a. used in filtration
b. to measure specific or accurate amounts of liquid
c. Separate two immiscible liquids like oil and water
d. used for small scale experiments
e. to measure temperature
f. to measure approximate volumes of liquid or to act as a liquid container

7. Beaker F
8. Separating funnel C

g. distribution of heat
h. to measure inaccurate different volumes of liquid

04. The most suitable apparatus to dissolve salt in water is:
[-A-] Cylinder
[-B-] Beaker
[-C-] Pipette
[-D-] Burette

2. Recognize the shape of some chemical apparatus

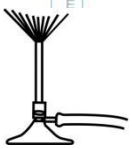
05. Give the name of the following chemical apparatus:

Pipette

Funnel

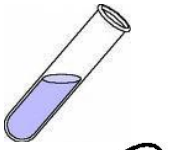
Measuring cylinder

Beaker



Bunsen burner

Wire gauze



Test Tube

Thermometer

Test tube holder

3. Know what crystallization is

06. crystallization is the process of forming crystals. What is the missing word?

4. Know three ways to obtain crystals*

07. Complete the following sentence. Crystals can be obtained from a _____ (pure solid/ pure liquid/ pure gas) by cooling it.

08. Crystals can be obtained from a _____ (pure liquid/ pure solid/ pure gas/ salt solution/ sugar solution) by evaporation or heating.

12. List three ways to obtain crystals: cooling pure liquid, heating solution, evporation

5. How to obtain crystals from aqueous solutions*

09. What are the necessary steps needed to obtain salt crystals from an aqueous solution using a dish?

1. Use tongs to carry the hot dish.
2. Place the dish over a steam bath.
3. The water in the beaker is stirred continuously.
4. Heat the dish directly with the Bunsen burner until most of the water has evaporated.
5. A beaker half filled with water is heated to boiling to prepare a steam bath.

6. How to obtain good, larger crystals from smaller crystals of salt*

10. In order to obtain, larger crystals from smaller crystals of sugar, filter the solution by pouring it through

[-A-] a layer of soil
[-B-] a layer of saw dust
[-C-] two layers of kitchen paper
[-D-] a layer of graph paper
[-E-] a layer of grass

11. To obtain good, larger crystals from smaller crystals of sugar, filter the solution and place it in a clean glass covered with a(n) _____.

1 light sheet of paper
2 cup made of metal
3 tightly closed bottle
4 heavy sheet of metal

7. Know what filtration is

12. Complete the following sentence. filtration is a process of separating a liquid from an insoluble solid.

8. Items required to perform filtration

13. Which of the following equipment is (are) needed to filter a solution?

[-A-] Filter paper
[-B-] Filter funnel [-C-] Tongs
[-D-] Beaker or conical flask to collect the filtrate
[-E-] Filter stand
[-F-] Test tube to collect the residue

Chapter 2: Revision of the Scientific Method

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

Section №: 1 Experiments and Generalizations

Concept №:

1. <u>Know what an experiment is</u>

01. An experiment is defined as:

[-A-] controlled sequence of events

[-B-] a rule framed on a collection of individual facts.

2. <u>Know what a generalization is*</u>

02. What is a generalization?

[-A-] controlled sequence of events

[-B-] a rule framed on a collection of individual facts.

3. <u>Know when a generalization is proved to be true*</u>

03. When is a generalization proved to be true?

when it is consistent with known facts

Section №: 2 Change of State

Concept №:

1. <u>Reading a heating curve of a pure compound</u>

04. What is the instrument used in measuring the temperature to plot heating curves?

Thermometer

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05. How many stages are there in the graph if the temperature vs. Time is plotted when a pure solid is heated to a temperature above its melting point?

[-A-] one

[-B-] two

[-C-] three

[-D-] four

06. Which one of the following is ***TRUE*** when a solid is heated?

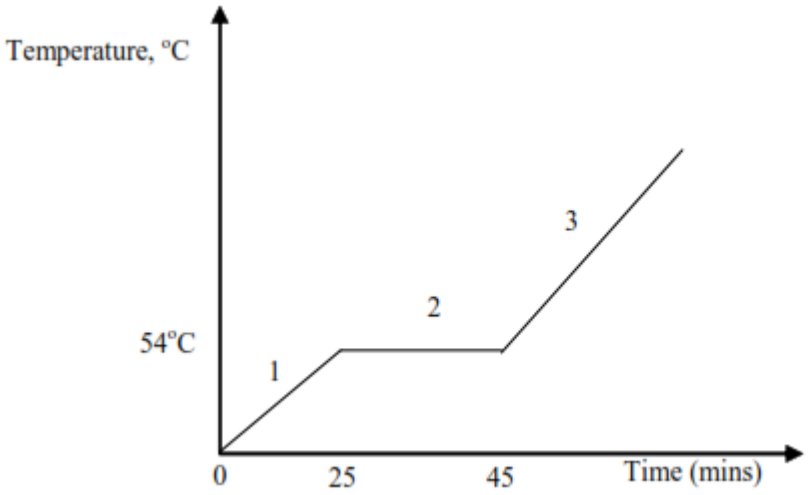
[-A-] A plot of temperature versus distance can be drawn.

[-B-] A plot of temperature versus time can be drawn.

[-C-] Energy is added at an increasing rate.

[-D-] Energy is added at a constant rate.

07. The following is the warming behaviour for 2.00 g of pure solid substance Y



a) What is the melting point of substance Y? 54C

b) When does the compound start melting? 25 min

c) When does the compound finish melting? 45 min

d) How long does the melting process take? 20 min

e) In which state(s) does pure substance Y exist in?

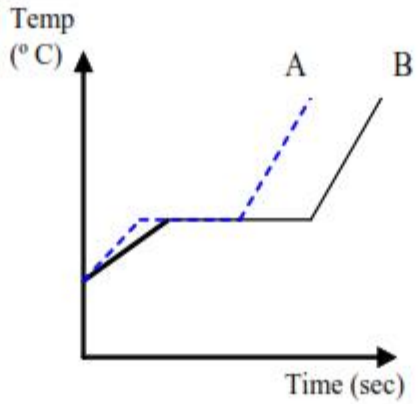
i- Region 1: solid

ii- Region 2: solid + liquid

iii- Region 3: liquid

2. Comparing heating curves of 2 samples of the same solid with different masses

08. If two samples of the same solid with different masses were heated:



[-A-] Which substance is lighter and which one is heavier?

A is lighter, B is heavier

9. Which one of the following is ***TRUE*** when a liquid is cooled?
[-A-] A plot of temperature versus distance can be drawn.
[-B-] A plot of temperature versus time can be drawn.
[-C-] Energy is released at an increasing rate.
[-D-] Energy is released at a constant rate.

4. Comparing cooling curves of 2 samples of the same solid with different masses

10. Two samples of the same liquid with different masses were cooled below their melting point. Which of the following is ***TRUE***?

1. The heavier sample will have the same freezing point as the lighter sample.
2. The heavier sample will take more time to freeze.
3. The heavier sample will have a higher freezing point.
4. The heavier sample will take less time to freeze.

Section №: 3 A Generalization About the Melting of Solids

Concept №:

1. Melting and freezing point of a solid

11. What is the temperature at which a pure substance melts called? What other name can be given to it?

melting and freezing point

12. On what factor(s) does the melting and freezing points of a pure substance depend?

Nature of substance

13. The melting point is freezing point._____ (greater than/ smaller than/ the same as) the freezing point.

2. <u>Know examples of physical constants</u>

14. Which of the following is not a physical constant of a pure solid?

[-A-] melting point of this solid

[-B-] its freezing point

[-C-] its density

[-D-] its mass

3. <u>Difference between a phase and a state</u>

15. Explain, giving examples, the difference between 'state' and 'phase'. Is it possible to have two phases in the same state?

S, L, G : state of matter , phase uniform medium,

~~Yes~~

4. <u>Number of states and phases in a certain system</u>

26. How many 'states' and 'phases' is (are) there in the following mixtures:

[-A-] sugar and water: 2 state , 1 phase

[-B-] salt and sand: 1 state , 2 phase

[-C-] water and oil: 1 state , 2 phase

Section №: 5 Avogadro's Number and the Mole Concept

Concept №:

1. What a mole is

01. What is a mole?

Avogadros number of particles =6 x 10^{23}

2. Defining the amu

02. The atomic mass unit , amu, is exactly 1/12 of the mass of a carbon atom.

3. The relation between a gram and the amu

03. The relation between gram and amu is represented by _____

1 g = 6 x 10^{23} amu (Use N_A = 6 x 10^{23})

8. Given atomic mass, find mass of 1 mole in g

04. The atomic mass of Rubidium is 85, so the mass of one mole of Rubidium is 85 g _____

05. The atomic mass of silver (Ag) is 108. Find the mass of two moles of silver atoms.

216 g

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06. The atomic mass of helium is 4. The mass of :-

1 one mole of helium is 4 amu.
2 one mole of helium is 4 g.
3 one atom of helium is 4 g.
4 one atom of helium is 4 kg.

9. Given atomic mass, find mass of 1 atom in amu

07. The atomic mass of potassium (K) is 39. The mass of:-

1 one mole of potassium is 39 amu.
2 one mole of potassium is 39 kg.
3 one atom of potassium is 39 amu.
4 one atom of potassium is 39 kg.

08. The atomic mass of lithium (Li) is 7. The mass of one atom of lithium is 7 amu .

12. Find the molecular mass of a compound

09. Given the following atomic masses: N = 14; O = 16. What is the molecular mass of N_2O_5?

108 g/ mol

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13. Find the mass of 1 mole of a compound

10. (Given: atomic masses of H = 1; O = 16; and S = 32). The mass of one mole of sulphuric acid, H_2SO_4, is 98g

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14. Find the molar mass of a compound

11. Given the following atomic masses: N = 14; O = 16. What is the molar mass of N_2O_3?

62g/mol

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15. Given atomic mass and mass, find no. of moles n = m/M.

12. How many moles are there in 3.9g of K? [Atomic mass of K = 39]

0.1 mol

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13. Find the number of moles in 51g of ammonia gas (NH_3). [N= 14; H = 1]

3 mole

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14. How many moles are present in 6.3 g of nitric acid HNO_3? [Given atomic mass of H = 1, N = 14 and O = 16]

0.1 mole

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15. How many moles are contained in 620 g of pure H_2CO_3? [Given atomic masses: H = 1, C = 12 and O = 16]

10 mole

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16. Which has more number of moles: 22 g of carbon dioxide gas (CO_2) or 12 g of carbon (C)? [Given atomic masses: C = 12 and O = 16]

C

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16. Given atomic mass and mole, find the mass n = m/M.

17. Given 32 g of oxygen gas, O_2. How many moles of O_2 are there in this quantity? [Given atomic mass of O = 16]

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1 mole

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18. The atomic mass of iron (Fe) is 56. What is the mass of 3.5 moles of iron?

196 g

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19. What is the mass of 3 moles of acetic acid, CH_3COOH? [Given that atomic mass of H=1; C = 12 and O=16].

180 g

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20. Which has a larger mass in grams: 4 moles of carbon dioxide gas (CO_2) or 2 moles of carbon (C)? [Given atomic masses: C = 12 and O = 16]

CO_2

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17. <u>Given mole, find № of atoms n(atoms) = atomicity x n(moles) x N_A</u>

21. How many atoms are present in 3.5 moles of carbon dioxide gas (CO_2)? [Given atomic masses: C=12 and O=16]. Use Avogadro's number $N_A = 6 \times 10^{23}$

6.3×10^{24} atoms

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22. How many atoms are found in 0.5 moles of Fe? Use Avogadro's number $N_A = 6 \times 10^{23}$.

3×10^{23} atoms

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18. <u>Given ato mic mass an d mass, f in d № of atoms n = m/M</u>
<u>n(atoms) = atomicity x n(moles) x N_A</u>

23. What is the number of atoms found in 93 g of phosphorus (P)? [Given that atomic mass of phosphorus P = 31]. Use Avogadro's number $N_A = 6 \times 10^{23}$

$18x\ 10^{23}$ atoms

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24. Which has more number of atoms: 3.2 g of oxygen gas (O_2) or 2.4 g of carbon (C)? [Given atomic masses: C = 12 and O = 16]. Use Avogadro's number $N_A = 6 \times 10^{23}$

Equal

Chapter 4: Chemical Reactions

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

Section №: 1 Physical and Chemical Change

Concept №:

1. <u>Distinguishing between chemical and physical changes</u>

01. Which of the following can be found in a chemical change?
[-A-] No new substances are produced.
[-B-] It is not easily reversible.
[-C-] It is easily reversible.
[-D-] Small amount of heat is involved in the reaction.
[-E-] New substances are produced.
[-F-] Large amount of heat is involved in the reaction.

2. <u>Know that in chemical changes new substances are formed</u>

02. In chemical reactions, _____ (new / no new) substances are formed.

3. <u>Recognizing physical and chemical changes</u>

03. Which of the following is a physical change, and which one is a chemical change?
[-A-] Heating wax until it melts P
[-B-] Crushing some salt crystals into a powder P
[-C-] Decomposing water into its elements: hydrogen and oxygen C
[-D-] Changing water to steam P
[-E-] The burning of magnesium in air C
[-F-] The burning of wood in air C
[-G-] Rusting of iron in moist air C

Section №: 2 Principles of Chemical Reactions

Concept №:

1. <u>Recognize a combustion reaction</u>

04. Which of the following is a combustion reaction?
[-A-] A magnesium ribbon heated in air.
[-B-] The reaction between fuel and oxygen after ignition
[-C-] The reaction between iron and moist air that gives rust.
[-D-] A piece of sodium metal ignites explosively when heated in pure chlorine.

2. <u>Recognize an exothermic process</u>

05. In an exothermic reaction, energy is _____ (released/ consumed/ produced/ used).

06. Which of the following is ***NOT*** an endothermic reaction?
[-A-] Electrolysis of water.
[-B-] Heating water from 30^{o}C to boiling continuously at 100^{o}C.
[-C-] Any reaction or process that uses heat energy.
[-D-] The burning of magnesium ribbon in air.
[-E-] Heating water from 10oC to 70oC.
[-F-] Heating water from 10oC until it boils.
[-G-] A reaction or process that release (produce) heat energy.
[-H-] Burning of wood in air.

3. <u>Recognize an endothermic process</u>

07. In an endothermic reaction, energy is _____ (released/ consumed/ produced/ used).

08. Which of the following is an endothermic reaction?
[-A-] Electrolysis of water.
[-B-] Heating water from 30^{o}C to boiling continuously at 100^{o}C.
[-C-] Any reaction or process that uses heat energy.
[-D-] The burning of magnesium ribbon in air.
[-E-] Heating water from 10^{o}C to 70^{o}C.
[-F-] Heating water from 10^{o}C until it boils.
[-G-] A reaction or process that release (produce) heat energy.
[-H-] Burning of wood in air.

4. <u>Conservation of atoms and mass in chemical</u>

09. In a chemical reaction, the number of atoms and mass are _____ (conserved/ not conserved).

10. Consider the following reaction: $2NO + O_2 \rightarrow 2NO_2$.
- Are the atoms of oxygen and nitrogen conserved?

yes

- Is the total number of atoms conserved?

yes

- Are molecules conserved?

yes

- Check if the molecules are conserved.

yes

5. <u>Application of conservation of atoms and mass in chemical reactions</u>

11. If 4.0 g of a substance A reacts with 19.0 g of a substance B to produce 6.0 g of a substance C and some substance D, What mass of D do you expect to have?

17

Section №: 3 Representing a Chemical Reaction by a Chemical Equation

Concept №:

1. Read a given chemical equation

12. How do you read the following equations in terms of molecules?

a) $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

One molecule of C_2H_4 + 3 molecules of O_2 produce 2 molecules of CO_2 and 2 molecules of H_2O

b) $N_2 + 3H_2 \rightarrow 2NH_3$

One molecule of N_2 + 3 molecules of H_2 produce 2 molecules of NH_3

c) $S_8 + 8O_2 \rightarrow 8SO_2$

One molecule of S_8 + 8 molecules of O_2 produce 8 molecules of SO_2

2. Know the terms 'subscript' & 'coefficient' in, say, 4 CO_2

13. Complete the following sentence. In the following symbol: 3 H_2SO_4 ,

[-A-] 3 is a coefficient

[-B-] 2 is a coefficient

[-C-] 4 is a subscript

[-D-] 2 is a subscript

14. Complete the following sentence. In the following symbol: 4 NH_3

[-A-] 4 is a coefficient

[-B-] 3 is a coefficient

[-C-] 4 is a subscript

[-D-] 3 is a subscript

3. Recognize a balanced equation

15. Which of the following reactions is/are balanced?

1. $3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

2. $N_2H_4 + O_2 \rightarrow 2H_2O + N_2$

3. $3Fe + 2Cl_2 \rightarrow 3FeCl_3$

4. $Mg + O_2 \rightarrow MgO$

5. $NH_3 + O_2 \rightarrow N_2 + H_2O$

6. $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$

7. $CaCO_3 \rightarrow CaO + CO_2$

16. Balance the following reaction:

1. $C_4H_{10} + O_2 \longrightarrow CO_2 + H_2O$

2. $C_2H_5OH + O_2 \longrightarrow CO_2 + H_2O$

3. $(NH_4)_2\ Cr_2O_7 \longrightarrow Cr_2O_3 + N_2 + H_2O$

4. $Au_2S_3 + H_2 \longrightarrow H_2S + Au$

5. $C_{25}H_{52} + O_2 \longrightarrow CO_2 + H_2O$

6. $Pb(NO_3)_2 + H_3AsO_4 \longrightarrow PbHAsO_4 + HNO_3$

7. $C_{12}H_{22}O_{11} + O_2 \longrightarrow CO_2 + H_2O$

8. $C_6H_6 + O_2 \longrightarrow CO_2 + H_2O$

Section №: 4 Stoichiometry

1. Reading a balanced equation in molecules and moles

18. How can you read the following equation in terms of molecules and moles?

$2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$

two molecule of C_2H_6 + 7 molecules of O_2 produce 4 molecules of CO_2 and 6 molecules of H_2O

~~two mole of C_2H_6 + 7 mole of O_2 produce 4 mole of CO_2 and 6 mole of H_2O~~

19. Equations with whole-number coefficients are read only in molecules or mole

2. Reading a balanced equation with fractional coefficients in moles

20. How would you read the equation: $H_2\ (g) + ½\ O_2\ (g) \rightarrow H_2O\ (g)$

One molecule of H_2 + half molecules of O_2 produce one molecules of H_2O

21. Equations with fractional coefficients are read only in molecules

3. Use equations to get mass ratio of reactants and products

22. Give the ratio by mass of reactants and products in the following equation:

$H_2\ (g) + ½\ O_2\ (g) \rightarrow H_2O\ (g)$ [O = 16, H = 1]

2 g of H_2 + 16 of O_2 produce 16 g of H_2O

23. Give the ratio by mass of reactants and products in the following equation:

$2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$ [C =12, O = 16, H = 1]

60 g of C_2H_6 + 224 g of O_2 produce 176 of CO_2 and 108 of H_2O

10. Reaction ratios involving masses and moles

24. Consider the following reaction:

$N_2\ (g) + 3H_2\ (g) \rightarrow 2NH_3\ (g)$

What are the ratios of reactants and products in moles?

[-A-] 1 mole N_2 + 3 moles of $H_2 \rightarrow$ 2 moles of NH_3

[-B-] 1 mole N_2 + 2 moles of $H_2 \rightarrow$ 3 moles of NH_3

[-C-] 2 mole N_2 + 1 moles of $H_2 \rightarrow$ 2 moles of NH_3

[-D-] 3 mole N_2 + 2 moles of $H_2 \rightarrow$ 1 moles of NH_3

[-E-] 4 mole N_2 + 2 moles of $H_2 \rightarrow$ 1 moles of NH_3

25. Consider the following reaction:

$N_2\ (g) + 3H_2\ (g) \rightarrow 2NH_3\ (g)$ [N =14, H = 1]

What are the ratios of reactants and products in grams?

[-A-] 17g of N_2 + 8g of $H_2 \rightarrow$ 34g of NH_3

[-B-] 28g of N_2 + 6g of $H_2 \rightarrow$ 34g of NH_3

[-C-] 14g of N_2 + 2g of $H_2 \rightarrow$ 17g of NH_3

[-D-] 36g of N_2 + 1g of $H_2 \rightarrow$ 37g of NH_3

[-E-] 18g of NH_3 + 2g of $H_2 \rightarrow$ 17g of NH_3

11. Apply conservation of mass to chemistry problems

26. Show that the mass is conserved in the following reaction:

$N_2\,(g) + 3H_2\,(g) \rightarrow 2NH_3\,(g)$ [N =14, H = 1]

28g of N_2 + 6g of H_2 → 34g of NH_3

12. Given mass of one reactant, find mass of other

27. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

How many grams of hydrogen gas (H_2) will be used if 6.4 g of O_2 are consumed? [H=1; O=16]

0.8 g

13. Given mass of one reactant, find moles of other

28. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

How many moles of hydrogen gas (H_2) will react with 12.8 g of O_2? [H=1; O=16]

0.8 g

29. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

How many moles of water (H_2O) are produced if 6.4 g of O_2 are consumed? [H=1; O=16]

0.4 mole

14. Given moles of one reactant, find moles of other

30. Consider the following reaction:

$N_2\,(g) + 3H_2\,(g) \rightarrow 2NH_3\,(g)$ [N =14, H = 1]

How many moles of H_2 will be consumed if 0.5 mole of N_2 gas is used?

1.5 mole

15. <u>Given mass of one reactant, find mass of product</u>

31. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

How many grams of H_2O are produced if 8g of H_2 are consumed? [H=1; O=16]

72 g

32. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

How many grams of hydrogen gas (H_2) are consumed if 3.6g of H_2O produced? [H=1; O=16]

0.4 g

4. <u>Standard temperature and pressure (STP)</u>

33. What does the Standard Temperature and Pressure (STP) refer to?

Standard temperature and pressure (T= 0 C p= 1 atm)

34. How do the molar volumes of gases, solids and liquids compare?

Gas > liquid > solid

5. <u>At STP 1 mole of gas occupies 22.4 dm^3</u>

35. What is the molar volume of a gas at STP conditions?

22.4 dm^3

6. <u>Volume relations in balanced chemical equations</u>

36. In the reaction below, at STP, what is the reacting ratio by Volume?

$CH_4\,(g) + 2O_2\,(g) \rightarrow CO_2\,(g) + 2H_2O\,(g)$

22.4 dm^3 of C_2H_6 + 44.8dm^3 of O_2 produce 22.4 dm^3 of CO_2 and 44.8 dm of H_2O

8. Reaction ratios involving volumes at STP and masses

37. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

What is the volume of H_2 gas that can produce 32g of H_2O at STP? [H=1; O=16]

39.8 dm^3

9. Reaction ratios involving volumes at STP and moles

38. What volume of CO_2, in dm^3 at STP is produced if 3.5 moles of O_2 are consumed?

$$C_2H_4\,(g) + 3O_2\,(g) \rightarrow 2CO_2\,(g) + 2H_2O(l) + 800\ kJ$$

52.2 dm^3

16. Given moles of product, find STP volume of one reactant

39. Consider the following reaction:

$$2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{\,(g)} + 496\ kJ$$

What is the volume of H_2 gas that can produce 4.5 moles of H_2O at STP? [H=1; O=16]

100.8 dm^3

7. Writing an equation with the energy involved

40. Consider the equation: $2H_2\,(g) + O_2\,(g) \rightarrow 2H_2O\,(g)$

If we are to write the equation to include the information that the reaction is exothermic, evolving 284 kJ/mol H_2, what do we add, and to which side?

$2H_2\,(g) + O_2\,(g) \rightarrow 2H_2O\,(g) + 284\ kJ$

41. Write the reaction that describes the following:
Hydrogen gas (H_2) reacts with oxygen gas (O_2) to produce water (H_2O) and 224 KJ of energy.

$2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (g) + 224\ kJ$

42. Write the reaction that describes the following:
One mole of solid carbon (C) reacts with one mole of oxygen gas (O_2) to produce one mole of carbon dioxide (CO_2) with an energy release of 420 KJ.

$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g) + 420\ kJ$

17. <u>Given quantity of one reactant find heat evolved</u>

43. Calculate the amount of energy produced when 3.2g of O_2 reacts completely in the following reaction: $2H_2\ (g) + O_2\ (g) \longrightarrow H_2O\ (g) + 224\ KJ$ [H=1, O = 16]

22.4 KJ

44. Consider the following reaction:

$$2H_{2\ (g)} + O_{2\ (g)} \rightarrow 2H_2O_{\ (g)} + 496\ kJ$$

What is the amount of heat produced if 4 g of O_2 reacted? [H=1; O=16]

62 KJ

18. <u>Recognize limiting reagent*</u>

45. What is a limiting reagent?

The substance that consumed firstly

46. Consider the following reaction: $2H_2\ (g) + O_2\ (g) \longrightarrow H_2O\ (g) + 224KJ$
[H=1, O = 16]
If 32g of O_2 and 0.5 moles of H_2 are given initially, which reactant is the limiting reagent? [S = 32 and O = 16]

H_2

47. Consider the following reaction: $4Fe\ (s) + 3O_2\ (g) \longrightarrow 2Fe_2O_3\ (s)$
[Fe = 56, O = 16]
Suppose that 0.56g of Fe*(s)* and 44.8 L of O_2 *(g)* are given initially at STP. What is the limiting reagent?

Fe

19. ~~One reactant is in excess, find moles of product*~~

48. Consider the following reaction: $4Fe\ (s) + 3O_2\ (g) \longrightarrow 2Fe_2O_3\ (s)$
[Fe = 56, O = 16]

- Suppose that 5.6g of Fe*(s)* and 44.8 L of O_2 *(g)* are given initially at STP. What is the limiting reagent?

Fe

- How many moles of Fe_2O_3 are produce

0.05 mole

Chapter 5: The Gas Phase

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

Section №: 1 Molar Volumes of Gases
Concept №:

1. Know that the molar volume in the gaseous state is much larger

01. The volume occupied by one mole of *any* pure substance under *normal* temperature and pressure is generally the _____ (smallest/ largest) for gases and the _____ (smallest/ largest) for solids.

2. Know the meaning of the volume of a gas

02. The volume a certain gas is _____ (dependent/ independent) on its container.

3. Know how the molar volume of gases changes with molar mass

03. As the molar mass of a real gas increases, the molar volume will _____ (increase/ decrease).

4. Know how the molar volume of gases changes with atomicity

04. As the atomicity of a real gas increases, the molar volume will _____ (increase/ decrease).

5. Given mass and volume of gas at STP, find mass of 1 mole

05. 5.6 L of a gas at STP have a mass of 8.0 g. What is the mass of one mole of this gas? *[Given that 1 mole of any gas has a volume of 22.4 L at STP conditions]*

~~32 g~~

06. 50 dm^3 of a gas at STP have a mass of 9.0g. The mass of one mole of this gas is _____. *[Given that 1 mole of any gas has a volume of 22.4 L at STP conditions]*

4.032 g

6. Know how PxV varies with increasing temperature for a real gas

07. What will happen when the pressure of a real gas increases at a constant temperature?

~~The molar volume decrease~~

08. As temperature increases, how P x V varies? increase

7. Know how PxV varies with changing pressure for a real gas

09. As the pressure of the gas increases, _____. What is the missing phrase?

[-A-] the volume decreases until a point where the gas becomes a liquid and P.V= constant can't be applied anymore.

[-B-] the volume increases until a point where the gas becomes a solid.

[-C-] the temperature decreases and the gas becomes a liquid.

[-D-] the volume will not change.

Section №: 2 The Kinetic Theory of Gases

Concept №:

1. Kinetic theory of gases

10. What is the kinetic theory of gases?

A model of randomly moving particles colliding with the container to exert pressure

2. Know why at a higher temperature a gas exerts a higher pressure

11. According to the kinetic energy, why does a gas exerts a higher pressure at a higher temperature?

The molecules move faster and colloids faster exerting high pressure

3. Know that at a higher temperature gas molecules move more rapidly

12. How do molecules move at a higher temperature? faster

4. Know that at the same temperature different gases have the same molecular KE

13. If two gases are present at the same temperature, then they have the same average Kinetic energy.

14. Which of the following gases oxygen (O_2) or hydrogen (H_2) moves faster if they are present at the same conditions of temperature and pressure? [H = 1 and O = 16]

H_2

5. Know effect of temperature on volume of gas at constant P

15. What is the effect of temperature on volume at constant pressure?

As T increase , the volume increase.

16. At a constant pressure, the graph of the *Volume* of a fixed mass of gas vs. *Temperature* in °C is _____ (a curve passing through the origin/ a curve not passing through the origin/ a straight line not passing through the origin/ a straight line passing through the origin).

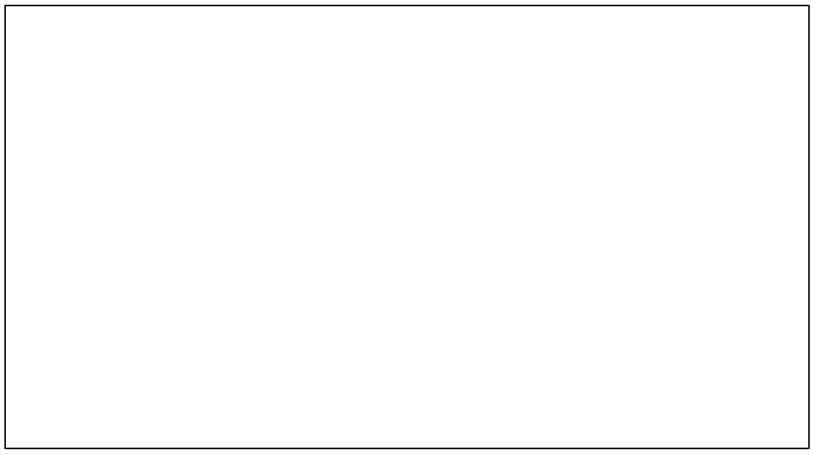
6. Know what is meant by an ideal gas

17. What is an ideal gas?

A gas that does not liquefy and whose molecules have zero volume

7. Know that the absolute zero is 0K which is -273^{o}C

18. What is the graph plotted of *Volume vs Temperature*?



19. 'At constant pressure, the volume V of a fixed amount of gas is *directly proportional* to _____ (Temp in ^{o}C/ Temp in K).

20. What is zero Kelvin? _____

21. The temperature of -273 ^{o}C is called Absolute zero

8. Know the magnitude of Kelvin

22. What is the magnitude (size) of the Kelvin as compared to a ^{o}C?

[-A-] The size of the Kelvin is the same size as the Celsius degree: 1K = 1^{o}C

[-B-] The size of the Kelvin is the same as – 273 ^{o}C

[-C-] The size of the Kelvin is the same size as Fahernheit degree

9. Changing Celsius to Kelvin and vice-versa

23. What is the relation between ^{o}C (degree Celsius) and K (Kelvin)? K= C+273

24. 230K is how much in ^{o}C? -43 C

25. The temperature 27^{o}C is how much in Kelvin? 300 K

10. Volume of a gas is directly proportional to the absolute temperature

26. What is the relation between volume and temperature at a constant pressure?

Directly proportional

11. Relation between FP and BP of a gaseous substance and its molar mass*

27. How do the boiling points and freezing points in degrees Celsius of certain substances that are gaseous at room temperature change with increasing molar mass?

[-A-] In general, the higher the molar mass the higher is the FP and BP.

[-B-] In general, the higher the molar mass the lower is the FP and BP.

[-C-] In general, the freezing points and boiling points are directly proportional to the molar mass.

12. The barometer is used to measure atmospheric pressure

28. What is the instrument is used to measure the atmospheric pressure?

Barometer

13. Know what the unit 'Atmosphere' means

29. What is *atmosphere*?

The pressure that can support a column of mercury 760 mm high at 0 C

14. Know when and how to use the closed-end manometer

30. What does a closed-end manometer measure?

The pressure of gas in acontainer

31. In a closed-end manometer:-

[-A-] the level of mercury in the closed end arm is always lower than that of the other arm

[-B-] measuring the pressure of a gas depends on the atmospheric pressure

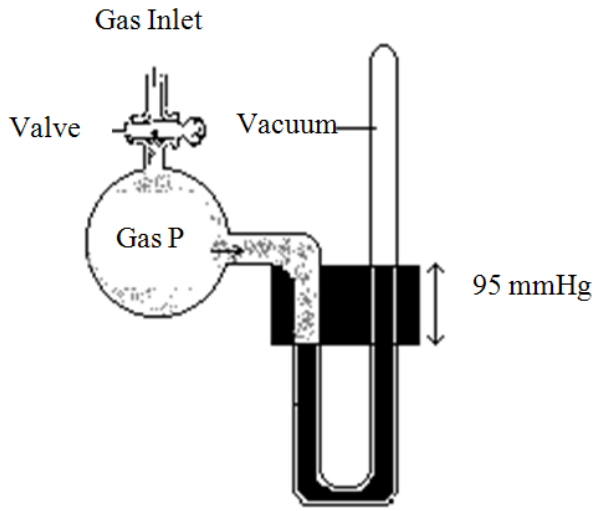
[-C-] measuring the pressure of a gas does not depend on the atmospheric pressure

[-D-] the level of mercury in the closed end arm is always equal to that of the other arm

15. Determine the pressure in a flask using a closed-end manometer

32. What is the pressure of the gas in the following closed-end manometer? Given: atmospheric pressure = 760 mm Hg.

95 mm Hg



16. Know when and how to use the open-end manometer

33. What does an open-end manometer measure?

Differences between the atmospheric pressure and pressure of column

34. In an open-end manometer:-

[-A-] the level of mercury in the open end arm is always lower than that of the other arm

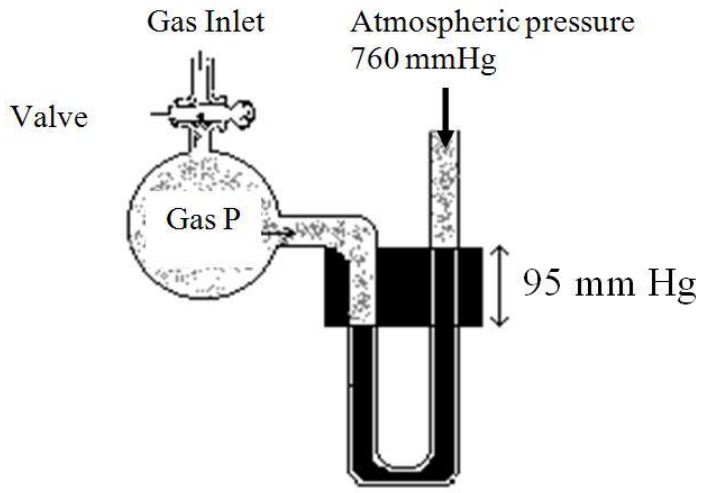
[-B-] measuring the pressure of a gas depends on the atmospheric pressure

[-C-] measuring the pressure of a gas does not depend on the atmospheric pressure

[-D-] the level of mercury in the closed end arm is always equal to that of the other arm

17. Determine the pressure in a flask using an open-end manometer

35. What is the pressure of the gas in the following open-end manometer? Given: atmospheric pressure = 760 mm Hg. 855 mm Hg



18. Know the meaning of partial pressure of a gas in a mixture of gases*

36. In a mixture of two gases A and B, the partial pressure of a gas means:

[-A-] The partial pressure is the pressure that the gas would exert on the atoms in the container

[-B-] The partial pressure is the pressure that the gas would exert if it were alone in the container

[-C-] The partial pressure is the pressure that the gas would exert between the molecules in the container

[-D-] The partial pressure is the pressure that gas A exert on gas B [-E-]

None of the above

37. The pressure exerted by each of the gases in a gas mixture is called _____ (partial pressure/ total pressure).

38. Define partial pressure.

The pressure exerted by each of the gases in a gas mixture

19. Determine total pressure of a gas in a mixture of gases*

39. When 0.3 mole of gas *A*, are put in a totally empty flask *X*, it exerts a pressure of 12 mm Hg. When 2.4 moles of gas *B* are put in the same totally empty flask *X*, it exerts a pressure of 96 mm Hg. Both quantities (of *A* and *B*) are now placed in an identical empty flask *Y*. Which of the following is ***TRUE*** about flask *Y*? The total pressure is =

[-A-] 96 mmHg

[-B-] 12 mmHg

[-C-] 84mmHg

[-D-] 108 mmHg

[-E-] 2.7 mmmHg

20. Know that the partial pressure ratio of gases equals their moles ratio*

40. When 0.3 mole of gas *A*, are put in a totally empty flask *X*, it exerts a pressure of 12 mm Hg. When 2.4 moles of gas *B* are put in the same totally empty flask *X*, it exerts a pressure of 96 mm Hg. Both quantities (of *A* and *B*) are now placed in an identical empty flask *Y*. Which of the following is *TRUE* about flask *Y*?

[-A-] Mole fraction of gas *A* = (108/12).

[-B-] Mole fraction of gas *A* = (0.3/2.7).

[-C-] Mole fraction of gas *A* = (12/96).

[-D-] Mole fraction of gas *A* = (2.4/2.7).

[-E-] Mole fraction of gas *A* = (108/96).

41. Choose the correct answer:
During applying the equation of state PV=nRT
[-A-] The mole ratio is equal to the temperature ratio.
[-B-] The mole ratio is equal to the universal constant R
[-C-] The partial pressure ratio is equals to mole ratio
[-D-] The pressure is inversely proportional to the temperature
[-E-] None of the above

42. A cylinder is filled with a mixture of O_2 and CO_2. The total pressure was 6 atm, and the pressure of O_2 was 2 atm. What was the mole fraction of CO_2?

4 atm

21. Mole fraction of gas A = ratio of partial pressure of A to total pressure*
43. Which of the following is ***TRUE*** about the mole fraction of gas A?
[-A-] Mole fraction of gas A is equal to the number of moles of gas A to the total volume
[-B-] Mole fraction of A is equal to the number of moles of gas A to the total pressure
[-C-] Mole fraction of gas A is equal to the number of moles of gas A to the number of moles of gas B
[-D-] Mole fraction of gas A is equal to the pressure of gas A to the total pressure

44. Define mole fraction

Mole fraction of gas A is equal to the pressure of gas A to the total pressure

45. 0.2 mole of oxygen gas (O_2) and 0.8 mole of nitrogen gas (N_2) are placed in an empty container of volume 24L. The total pressure in the container is 1 atm.

a. What is the total number of moles of gas in the container?

1mole

b. What is the mole fraction of O_2 (g) in the container?

0.2

c. What is the mole fraction of $N_2(g)$ in the container?

0.8

d. Find the partial pressure of O_2 (g)

0.2 atm

e. Find the partial pressure of N_2 (g)

0.8 atm

f. What is the volume of O_2 (g)

24 L

46. The sample of air was found to contain 0.64g of oxygen and 2.24g of nitrogen. The pressure of the sample was 760 mm of Hg [O=16, N=14]. Find the:

a. The total number of moles of gas in the sample.

0.1 mole

b. Mole fraction of oxygen in the sample.

0.2

c. Partial pressure of each oxygen and nitrogen in the sample.

0.2 atm , 0.8 atm

d. The percentage composition of air.

~~O: 22.2 % , N:77.8 %~~

Section №: 3 The Ideal Gas

Concept №:

1. Assumptions of the kinetic theory for an ideal gas*

47. The only form of energy of a particle of an ideal gas can carry is kinetic energy

2. How a real gas differs in behaviour from an ideal gas*

48. Answer by TRUE or FALSE. Correct the FALSE ones.

[-A-] The only form of energy a particle of an ideal gas can carry is potential. F

[-B-] Between collisions, particles of a gas move in parallel lines. F

[-C-] Ideal gases liquefy at high pressures and low temperature. F

3. Know the pressure-temperature behaviour for an ideal gas

49. The pressure of an ideal gas is:

[-A-] inversely proportional to the temperature

[-B-] directly proportional to the temperature

[-C-] directly proportional to the volume

[-D-] equal to atmospheric pressure

50. The P and absolute T for an ideal gas are related such that $P \propto T$.

51. The pressure of a fixed mass of an ideal gas in a container of a fixed volume:

[-A-] decrease as the temperature decrease

[-B-] increase as the temperature decrease

[-C-] decrease as the temperature increase

[-D-] inversely proportional to the temperature

[-E-] None of the above

52. A cylinder fitted with a piston has 40 dm^3 of a gas at 298^oC. How can you increase the pressure by 4 times if you vary only the temperature?

Increase T by 4 times

53. A cylinder fitted with a piston has 50 dm^3 of a gas at 300^oC. How can you increase the pressure by 3 times if you vary only the volume?

Decrease V by 3 times

5. Know the pressure-volume behaviour of an ideal gas

54. The volume, V, of an ideal gas is:

[-A-] Directly proportional to the pressure

[-B-] Inversely proportional to the temperature
[-C-] Inversely proportional to the pressure
[-D-] Inversely proportional to the number of moles
[-E-] Directly proportional to the pressure

55. For an ideal gas, how are the pressure and volume related? Inversely proportional

6. Know the pressure-moles behaviour of an ideal gas

56. The pressure of an ideal gas is always:
[-A-] Directly proportional to the number of moles
[-B-] Inversely proportional to the volume
[-C-] Inversely proportional to the number of moles
[-D-] Inversely proportional to the temperature

7. Derive the equation of state of an ideal gas

57. Which one of the following relations is ***NOT TRUE*** about the equation of state of an ideal gas?
[-A-] $P \propto T$
[-B-] $P \propto V$
[-C-] $P \propto n$
[-D-] $P \propto 1/V$

8. Recognizing the equation of state of an ideal gas

58. The equation of state of an ideal gas is:
[-A-] PV=nR/T
[-B-] PV=nT/R
[-C-] nPV=RT
[-D-] PV=nRT
[-E-] P=VRT/n

59. How many moles of an ideal gas occupy a volume of 44.8 dm^3 at a pressure of 0.5 atm and a temperature of 273K? Use R = 0.082 $atm.dm^3.mol^{-1}.K^{-1}$

1 mole

60. 3.2g of a gas occupy a volume of 9.4 L, at 27^{O}Cand 380 mm Hg. Find the molar mass of the gas. Use R = 0.082 $atm.dm^3.mol^{-1}.K^{-1}$

16.8 g/mole

61. Calculate the molar volume of an ideal gas at room temperature 25^{o}C and pressure 1 atm. Use R = 0.082 atm.dm^{3}.mol^{-1}.K^{-1}

24.436 L

62. What is the mass of oxygen gas O_2(g) if it occupies a volume of 500 mL at 28^{o}C and a pressure of 0.8 atm. [O=16] Use R = 0.082 atm.dm^{3}.mol^{-1}.K^{-1}

0.518 g

63. If an ideal gas occupies a volume of 500 mL at 2 atm, what will be the new volume at a pressure of 790 mm Hg and at constant temperature? (1 atm= 760 mmHg)

0.96 L

64. If an ideal gas occupies a volume of 500 mL at 1.5 atm and 28^{o}C, what will be the new pressure if the temperature is increased to 55^{o}C at a volume of 2L? (1 atm= 760 mmHg)

0.41 atm

9. Calculating the value of the universal gas constant

65. Knowing that one mole of a gas occupies 22.4 L at 0^{o}C and 1 atm, what is the value and unit of the universal gas constant, R?

0.082 atm.dm^{3}.mol^{-1}.K^{-1}

Section №: 4 Effusion of Gases

Concept №:

1. Know the meaning of effusion

67. What does effusion means?

2. Know that lighter molecules effuse faster such that MV^2 = constant

68. Which product was observed to be constant in the experiment of effusion?

MV^2 = constant

3. Effusion experiment shows that average molecular KE = k at constant temperature

69. Which generalizations can be made from the effusion experiment?

~~Effusion experiment shows that average molecular KE = k at constant temperature~~

5. Know how to find the pressure of H_2 (g) collected over water*

70. Suppose you have collected 300cm^3 of oxygen gas $O_{2\,(g)}$ over water at 25°C. The atmospheric pressure is 0.9 atm, and the vapour pressure is 0.0031 atm at 25°C.

a) What is the partial pressure of oxygen gas?

b) How many grams of oxygen have you collected? Use R = 0.082 $atm.dm^3.mol^{-1}.K^{-1}$