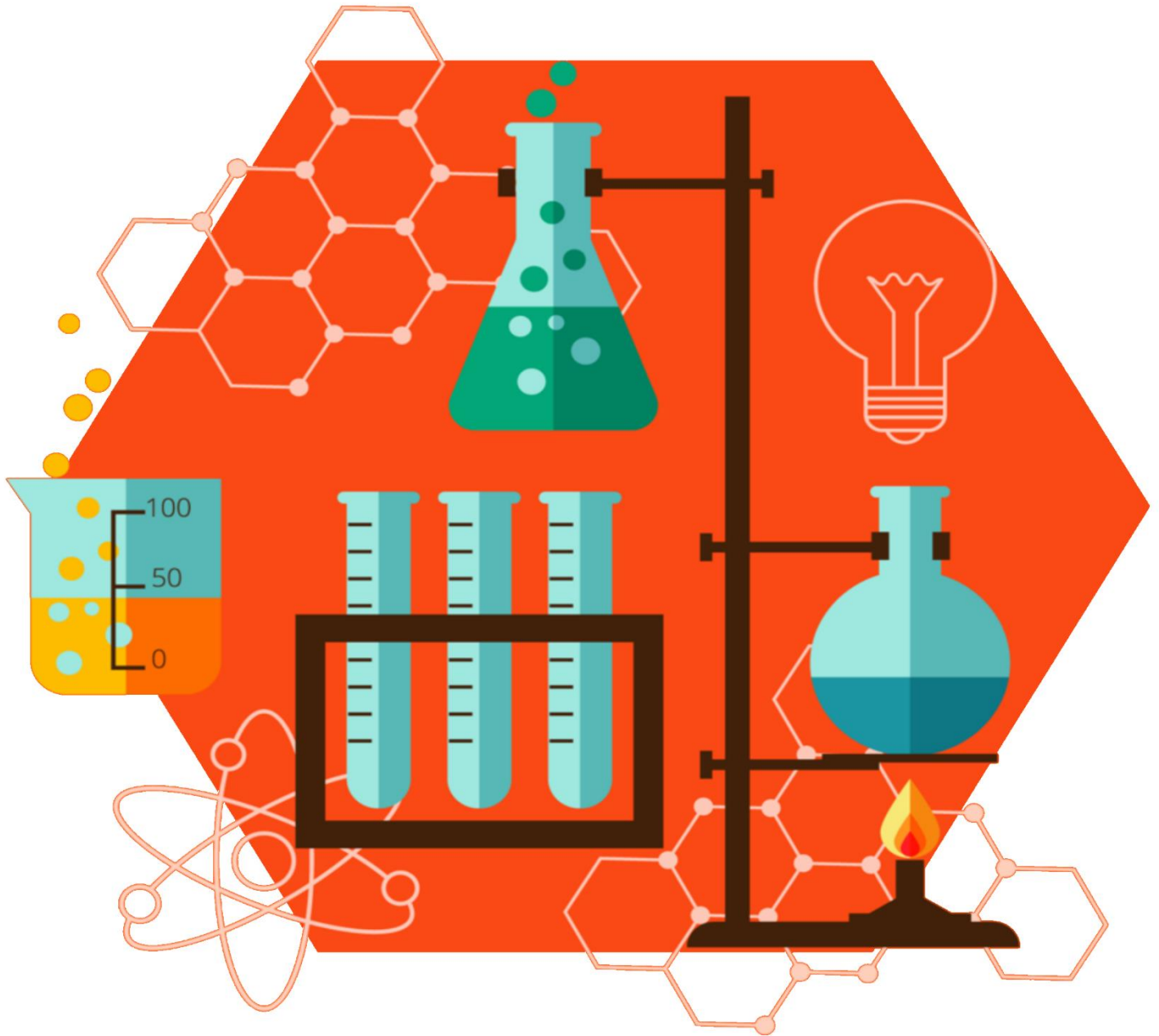# PAST PAPERS

CHEMISTRY

DONE BY: Ruaa Hdeib

CHAPTER 1

1. What is the length of 1.85 kilometre in units of micrometre with the correct number of significant figures?

A) $1.85 * 10^{-9}$

B) $1.85 * 10^{9}$

C) $2 * 10^{-5}$

D) $1.85 * 10^{6}$

E) $2 * 10^{-6}$

2. The SI units for length and amount of substance respectively are:

A) meter and gram

B) kilo meter and mole

C) kg and mole

D) meter and mole

3. Which of the following consist of one type of atom only:

A) elements

B) compounds

C) mixtures

D) solids

E) none of the above

4. Convert 40 (ng/cm³) to (pg/dm³):

A) $4 * 10^7$

B) $4 * 10^8$

C) $4 * 10^9$

D) $4 * 10^4$

5. The density in (g/ml) of a metal piece that has a volume of 1.68 cm³ and amass of a 52.8 g is:

A) 10

B) 21

C) 31.4

D) 0.1212

6. How many significant figures are there in 0.3070?

A) 6

B) 5

C) 4

D) 3

7. Which of the following is an intensive property?

A) length

B) area

C) density

D) energy

8. How many significant figures does the result of the following operation contain?

$$(8.52010 * 7.9)$$

A) 2

B) 3

C) 4

D) 5

E) 6

9. The result of (3.8621 * 1.5630) – 5.98 is properly written as:

A) 0.06

B) 0.05646

C) 0.056462

D) 0.0565

E) 0.056

10. The agreement of a particular value of measurement with the true value is called:

A) significance

B) certainty

C) precision

D) error

E) accuracy

11. Which of the following represents a chemical change:

A) melting of solid H_2O

B) separation of H_2O molecule into its atoms

C) Evaporation of liquid H_2O

D) Mixing H_2O with oil

E) condensation of H_2O vapor

12. Which of the following is an extensive property?

A) mass

B) temperature

C) boiling point

D) density

13. Convert 77°F to Kelvin scale.

A) 245 K

B) 452 K

C) 298 K

D) 195 K

14. Which of these is an example of a physical change?

A) corrosiveness of acid

B) apples when exposed to air, turn brown

C) lead becomes a liquid when heated to 601°C

D) burning of wood

15. Round the following number (0.0084977) into 4 digits with writing the answer in scientific notation.

A) $8.4977 * 10^{-3}$

B) $8.4977 * 10^{3}$

C) $8.498 * 10^{-3}$

D) $8.497 * 10^{3}$

E) $8.5 * 10^{3}$

16. Perform the following mathematical operation and express the result in the appropriate number of significant figures:

$$((2.085 * 4.1) - 1.13) = ?$$

A) 7.4185

B) 7.419

C) 7.42

D) 7.4

E) 7.0

17. The SI temperature unit is:

A) °C

B) °F

C) K

D) both A & B

E) both A & C

18. Accuracy is defined as:

A) a measure of how often an experimental value can be repeated.

B) the closeness of a measured value to the true value.

C) the number of significant figures used in a measurement.

D) none of the above.

19. Which of the following equalities is wrong?

A) 1.35 micrometres = $1.35 * 10^3$ millimetres

B) $7.43 * 10^{-2}$ nanometre = $7.43 * 10^{-8}$ millilitres

C) 3.5 kilograms = $3.5 * 10^6$ milligrams

D) $1.89 * 10^4$ decilitter = $1.89 * 10^3$ litter

20. The speed of a car is 32.0 miles/hour. What is its speed in m/s?
(given 1 mile = 1609 m)

A) 14.3

B) 16.1

C) 18.8

D) 20.6

CHAPTER 2

1. Which one of the following is correct:

A) The name of Cu_3N_2 is copper (II) nitrite.

B) The name of Fe_2O_3 is iron (II) oxide.

C) The name of CrO_3 is chromium (VI) oxide.

D) The name of Cr_2O_3 is dichromium trioxide.

E) The name of MnO_2 is manganese (II) oxide.

2. The name of Ca_2N_3 is:

A) calcium nitride

B) dicalcium trinitride

C) calcium nitrite

D) calcium nitrate

E) it is wrong formula

3. The chemical formula of calcium nitride is:

A) CaN

B) Ca_2N

C) CaN_2

D) Ca_3N_2

E) Ca_3N_3

4. The name of MgO_2 is:

A) magnesium sulfate

B) magnesium oxide

C) magnesium peroxide

D) magnesium dioxygen

5. Which of the following compounds would you expect to be ionic: NO_2, $AlCl_3$, NF_3, BF_3, $C_2H_4O_2$:

A) NO_2

B) NF_3, $AlCl_3$

C) BF_3, $C_2H_4O_2$, $AlCl_3$

D) BF_3, $AlCl_3$

6. The name of Mg_3P_2 is:

A) Magnesium phosphide

B) Magnesium sulfate

C) Magnesium phosphate

E) Magnesium phosphite

7. The chemical formula of sodium oxide is:

A) NaO

B) NaO_2

C) Na_2O_2

D) Na_2O

8. Which combination of formula/name is incorrect?

A) FeO / iron (II) oxide

B) Fe_2S_3 / iron (III) sulfide

C) Cr_3P / chromium (II) phosphide

D) $KMnO_4$ / potassium permanganate

9. The name of Cu_3PO_4 is:

A) copper (I) phosphate

B) copper (II) phosphate

C) copper (III) phosphate

D) copper phosphate

10. Which of the following is the formula of Hydrobromic acid?

A) KBr

B) HBr

C) HBrO

D) $HBrO_3$

11. Which of the following pair of elements would most likely form an ionic compound?

A) Al and Rb

B) I and Rb

C) Cl and I

D) C and S

12. The name of $HClO_2$ is:

A) hydrochloric acid

B) chlorous acid

C) hypochlorous acid

D) perchloric acid

13. Write the formula of disulfurdinitride:

A) S_2N

B) S_3N_2

C) S_2N_2

D) S_4N_2

14. The correct name of Mn_2O_4 is:

A) manganese (IV) oxide

B) manganese (VI) oxide

C) manganese peroxide

D) manganese (V) oxide

15. What is the symbol for an ion with 17 protons, 18 neutrons, and 18 electrons?

A) $^{32}S^{-2}$

B) $^{34}S^{-2}$

C) $^{35}Cl^{-}$

D) $^{56}Fe^{-2}$

16. Changing the number of neutrons of an atom change its:

A) isotope

B) element

C) ion

D) charge

E) molecules

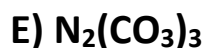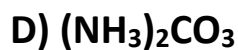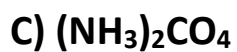17. Which of the species below is the nitride ion?

A) Na^+

B) NO_3^-

C) NO_2^-

D) N^{-3}

E) NH_4^+

18. The charge on the iron ion in the salt Fe_2O_3 is:

A) +1

B) +2

C) +3

D) -5

E) -6

19. The formula of ammonium carbonate is:

A) $(NH_4)_2CO_3$

B) NH_4CO_2

C) $(NH_3)_2CO_4$

D) $(NH_3)_2CO_3$

E) $N_2(CO_3)_3$

20. Which of the following is not correctly named?

A) $Pb(NO_3)_2$, lead (II) nitrate

B) $Mg(OH)_2$, magnesium hydroxide

C) H_3PO_4, phosphoric acid

D) NH_4ClO_4, ammonium chlorate

CHAPTER 3

1. The total number of atoms in 0.10 mol of NO_2 is:

   A) $2.0 * 10^{22}$

   B) $1.8 * 10^{23}$

   C) $3.0 * 10^{23}$

   D) $3.6 * 10^{-23}$

   E) $6.0 * 10^{22}$

2. The mass percent of oxygen in $C_7H_6O_2$ is:

A) 53

B) 40

C) 26

D) 69

E) 6.7

3. What is mass of chlorine in 14.6 g $CaCl_2$?

(atomic mass Cl = 35.45 g/mol & Ca = 40.08 g/mol)

A) 9.33 g

B) 6.77 g

C) 4.24 g

D) 8.05 g

4. The percent composition by mass of a compound is 76.0% C, 12.8% H, and 11.2% O. The molar mass of this compound is 284.5 g/mol. What is the molecular formula of the compound? Atomic mass: C=12.01; H=1.008; O=16.00

A) $C_{10}H_6O$

B) $C_9H_{18}O$

C) $C_{16}H_{28}O_4$

D) $C_{20}H_{12}O_2$

E) $C_{18}H_{36}O_2$

5. A compound of bromine and fluorine contains 58.37 mass percent bromine. Determine its empirical formula:

A) BrF_2

B) BrF_3

C) Br_2F_3

D) Br_3F

E) BrF

6. The number of oxygen atoms in 10.0 g of $Ca_3(PO_4)_23H_2O$ (molar mass = 364.3 g/mol) is:

A) $2.68 * 10^{23}$

B) $6.78 * 10^{23}$

C) $1.82 * 10^{23}$

D) $3.56 * 10^{23}$

E) $7.38 * 10^{23}$

7. How many grams of potassium are in 23.8 g of potassium dichromate $K_2Cr_2O_7$?

A) 2.02 g

B) 6.33 g

C) 4.04 g

D) 3.32 g

E) 5.15 g

8. One mole of H_2:

A) contains $6.0 * 10^{23}$ H atoms

B) contains $6.0 * 10^{23}$ H_2 molecules

C) contains 1 gram of H_2

D) is equivalent to $6.02 * 10^{23}$ g of H_2

E) none of the above

9. An unknown organic compound was analysed and the mass percent of the constituent atoms were: 64.3% carbon; 7.14% hydrogen; The empirical formula of this compound is:

A) $C_3H_4O_2$

B) C_6H_3O

C) C_3H_4O

D) C_3H_6O

E) $C_3H_6O_2$

10. Balance the following equation:

$$a\ Be_2C + b\ H_2O \rightarrow c\ Be(OH)_2 + d\ CH_4$$

The ratio of coefficients b/d in the balanced equation:

A) 1/2

B) 2/1

C) 1/4

D) 4/1

E) 3/1

11. All of the following are empirical formulas EXCEPT:

A) C_6H_5Cl

B) N_2O_4

C) Cr_2O_3

D) $Sn_3(PO_4)_4$

E) Na_2SO_4

12. The limiting reagent is the substance:

A) present in greatest quantity

B) limits the number of reagents present

C) determined by the amount of reactants present

D) that determines the maximum amount of possible product

13. What is the empirical formula of a substance that is 53.5% C, 15.5% H and 31.1% N by weight?

A) $C_4H_{14}N_2$

B) C_2H_7N

C) CH_4N_7

D) C_3HN_2

E) $C_{4.5}H_{15.5}N_{2.2}$

14. When it is correctly balanced, the correct coefficients for the equation below are:

$$PCl_3 + H_2O \rightarrow H_3PO_3 + HCl$$

A) 1, 3, 1, 1

B) 1, 3, 1, 3

C) 1, 1, 1, 3

D) 2, 3, 2, 3

15. Calculate the percent yield of iron if 950 g of Fe_3O_4 underwent the reaction shown in the chemical equation below and 533 g of Fe was isolated from the reaction mixture.

$$Fe_3O_4 \text{ (S)} + 2C \text{ (S)} \rightarrow 2CO_2 \text{ (g)} + 3Fe \text{ (S)}$$

A) 25.9%

B) 77.5%

C) 46.9%

D) 56.1%

16. Aluminium metal reacts with chlorine gas to form solid Aluminium chloride. What mass of chlorine gas (M.W Cl_2 = 70.9 g/mol) is needed to react completely with 163 g of aluminium (M.W Al = 26.9 g/mol)?

$$2Al_{(S)} + 3Cl_{2\,(g)} \rightarrow 2AlCl_{3\,(S)}$$
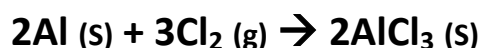
A) 324 g

B) 489 g

C) 214 g

D) 644 g

17. What is the mass of one Calcium (Ca) atom?

(Atomic mass of Ca = 40.08, NA = 6.022 * 10^{23})

A) 9.274 * 10^{-23} g

B) 6.656 * 10^{-23} g

C) 5.324 * 10^{-23} g

D) 4.037 * 10^{-23} g

18. What mass of copper (II) nitrate would be produced from the complete reaction of 45.6 g of copper, according to the chemical reaction shown below?

$$Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$$

A) 0.72 g

B) 21.1 g

C) 98.7 g

D) 135 g

CHAPTER 4

1. Consider the unbalanced chemical equation:

H_3PO_4 (aq) + $Ba(OH)_2$ (aq) → $Ba_3(PO_4)_2$ (S) + H_2O
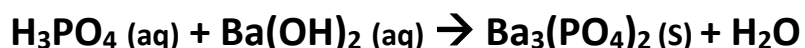
A volume of 46.0 mL of aqueous $Ba(OH)_2$ solution was required to react completely with 0.685 g H_3PO_4 (molar mass = 98.0 g/mol) to produce $Ba_3(PO_4)_2$. Calculate the molar concentration of the $Ba(OH)_2$ solution.
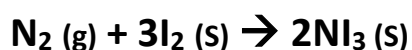
A)0.552 M

B)0.228 M

C)0.403 M

D)0.328 M

E) 0.655 M

2. If 318.0 mL of nitrogen gas measured at 488.9 mmHg and 22.3°C, reacts with excess iodine according to the following reaction, what mass of nitrogen triiodide (molar mass = 394.72) is produced?
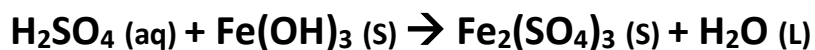
(1 atm = 760 mmHg and k = °C + 273)

N_2 (g) + $3I_2$ (S) → $2NI_3$ (S)

A) 3.33 g

B) 4.33 g

C) 13.30 g

D) 20.0 g

E) 6.65 g

3. Consider the unbalanced chemical equation:

H_2SO_4 (aq) + $Fe(OH)_3$ (S) → $Fe_2(SO_4)_3$ (S) + H_2O (L)

A volume of 38.0 mL of aqueous H_2SO_4 solution was required to react completely with 0.685 g $Fe(OH)_3$ (molar mass = 106.8 g/mol) to produce $Fe_2(SO_4)_3$. Calculate the molar concentration of the H_2SO_4 solution.

A) 0.253 M

B) 0.344 M

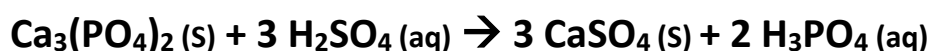C) 0.214 M

D) 0.301 M

E) 0.175 M

4. When 12.0 g of $Ca_3(PO_4)_2$ and 12.0 g of H_2SO_4 were allowed to react according to the following equation, 6.00 g of $CaSO_4$ were produced. Calculate the % yield of $CaSO_4$. Molar masses (g/mol): $Ca_3(PO_4)_2$ = 310.2; H_2SO_4 = 98.1; $CaSO_4$ = 136.1 and H_3PO_4 = 98.0

$Ca_3(PO_4)_2$ (S) + 3 H_2SO_4 (aq) → 3 $CaSO_4$ (S) + 2 H_3PO_4 (aq)

A) 63.3

B) 76.0

C) 88.6

D) 38.0

E) 50.6

5. Which of the following salts is insoluble in water?

A) $CuSO_4$

B) $BaCO_3$

C) $CaCl_2$

D) $Pb(NO_3)_2$

E) $Ba(OH)_2$

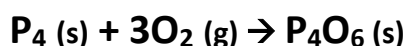6. Which of the following compounds is a nonelectrolyte?

A) $KOH_{(aq)}$

B) acetic acid, $CH_3COOH_{(aq)}$

C) methanol, $CH_3OH_{(aq)}$

D) sulfuric acid, $H_2SO_{4\ (aq)}$

E) ammonia, $NH_{3\ (aq)}$

7. Tetra phosphorus hexoxide P_4O_6 (molar mass = 219.9 g/mol) is formed by the following reaction:

$$P_{4\ (s)} + 3O_{2\ (g)} \rightarrow P_4O_{6\ (s)}$$

If a mixture of 38.7 g of oxygen (molar mass = 32 g/mol) and excess phosphorus actually produce 54.3 g of P_4O_6. What is the percent yield for the reaction?

A) 61.3%

B) 48.8%

C) 26.3%

D) 77.5%

E) 37.6%

8. Magnesium reacts with iron (III) chloride to form magnesium chloride and iron.

$3Mg_{(s)} + 2FeCl_{3\ (s)} \rightarrow 3MgCl_{2\ (s)} + 2Fe_{(s)}$

A mixture of 41.0 g of magnesium (molar mass = 24.31 g/mol) and 145 g of iron (III) chloride (molar mass = 162.2 g/mol) is allowed to react. What mass of magnesium chloride $MgCl_2$ (molar mass = 95.21 g/mol) is formed?

A) 136 g

B) 161 g

C) 146 g

D) 128 g

9. Calculate the molarity of solution prepared by diluting 165 mL of 0.700 M calcium chloride to 900.0 mL.

A) 3.86 M

B) 0.138 M

C) 0.182 M

D) 0.128 M

10. How much of 1.20 M NaOH will be needed to neutralize 168 mL of 3.0 M H_2SO_4?

A) 1.8 L

B) 0.042 L

C) 0.84 L

D) 0.090 L

11. What is the oxidation number for Platinum in $(PtCl_6)^{-2}$

A) -2

B) +4

C) -4

D) +1

E) +6

12. Calculate the oxidation number of sulfur , S , in the formula $Na_2S_2O_7$:

A) -2

B) +2

C) +4

D) +5

E) +6

13. Calculate the number of moles of sodium hydroxide in 2.45 L of 1.78 M NaOH solution.

A) 4.36 mol

B) 4.04 mol

C) 1.72 mol

D) 3.29 mol

E) 2.16 mol

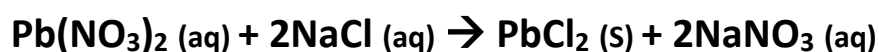14. Which of the following compounds is insoluble in water?

A) Na_2CO_3

B) $FeCO_3$

C) $(NH_4)_2CO_3$

D) Na_2S

E) $AgNO_3$

15. In the following reaction, what are the spectator ions?

$$Pb(NO_3)_{2\ (aq)} + 2NaCl_{(aq)} \rightarrow PbCl_{2\ (S)} + 2NaNO_{3\ (aq)}$$

A) $Na^+_{(aq)}$ and $Cl^-_{(aq)}$

B) $Pb^{+2}_{(aq)}$ and $Cl^-_{(aq)}$

C) $Pb^{+2}_{(aq)}$ and $NO_3^-_{(aq)}$

D) $Na^+_{(aq)}$ and NO_3^-

E) $NO_3^-_{(aq)}$ and $Cl^-_{(aq)}$

16. Which of the following is a weak acid?

A) H_2SO_4

B) HNO_3

C) HCL

D) HNO_2

E) HBr

17. Which of the following reaction is an acid-base reaction?

A) $NaCl_{(aq)} + AgNO_3 \rightarrow AgCl_{(S)} + NaNO_{3\ (aq)}$

B) $Cl_{2\ (g)} + 2HI_{(g)} \rightarrow 2HCl_{(g)} + I_{2\ (g)}$

C) $CH_{4\ (g)} + 2O_{2\ (g)} \rightarrow 2H_2O_{(L)} + CO_{2\ (g)}$

D) $Na_2CO_{3\ (S)} + 2HCl_{(aq)} \rightarrow H_2O_{(l)} + CO_{2\ (g)} + 2NaCl_{(aq)}$

E) $Ba(OH)_{2\ (aq)} + Na_2SO_{4\ (aq)} \rightarrow BaSO_{4\ (S)} + 2NaOH_{(aq)}$
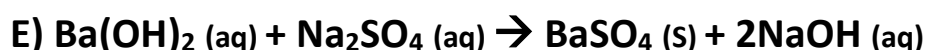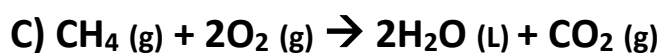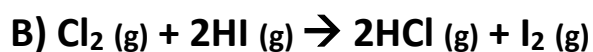
18. How many millilitres of 10.0 M HCl must be diluted to obtain 1.0 litter of 6.0 M HCL?

A) 375 mL

B) 300 mL

C) 260 mL

D) 600 mL

E) 450 mL

19. Which one of the following compounds is a strong electrolyte in aqueous solution?

A) H_2O

B) NaCl

C) HF

D) CH_3COOH

E) NH_3

20. Which of the following solutions has the least electrical conductance?

A) KNO $_{(aq)}$

B) $(NH_2)_2CO$

C) NaCl $_{(aq)}$

D) LiOH $_{(aq)}$

E) H_2SO_4 $_{(aq)}$

21. A student has a sample of 1.88 M HCL. What volume of water does he require to prepare 400 mL of 0.450 M HCL?

A) 23.9 mL

B) 95.7 mL

C) 352 mL

D) 304 mL

E) 47.9 mL

22. What mass of Li_3PO_4 (115.79 g/mol) is needed to prepare 500 mL of a solution having a lithium ion concentration of 0.175 M?

A) 6.75 g

B) 10.1 g

C) 19.3 g

D) 30.4 g

E) 3.38 g

CHAPTER 5

1. 550.0 mL sample of NO gas was collected over water at 25.0°C and an atmospheric pressure of 748 torr. Calculate the mass of dry NO in this sample.

Vapor pressure of H_2O at 25.0°C = 24 torr, and molar mass of NO = 30.0 g/mol

A) 0.374 g

B) 0.643 g

C) 0.771 g

D) 0.421 g

E) 0.549 g

2. Which of the following gases has the greatest density at 2.5 atm and 25°C? (Molar masses for C=12.0, H=1.01, N=14.0, O=16.0, S=32.1, and F=19.0 g/mol)

A) N_2O

B) SO_2

C) C_4H_8

D) O_2

E) NF_3

3. Calculate the density of CO_2 gas (in g/L) at 25°C and 1.60 atm (molar mass of CO_2 = 44.0 g/mol).

A) 2.52

B) 2.70

C) 2.88

D) 2.10

E) 2.34

4. A sample of 1.40 g of a vapor occupies 0.559 L at 97°C and 0.967 atm. Calculate the molar mass of the compound.

A) 98.3

B) 78.7

C) 124

D) 144

E) 112

5. A mixture of 0.260 moles O_2 and 0.540 moles N_2 has a total pressure of 4.00 atm. Calculate the partial pressure of O_2 in the mixture.

A) 1.30 atm

B) 2.60 atm

C) 3.25 atm

D) 0.980 atm

E) 1.95 atm

6. For the following gasses (given molar masses):

$$F_2(38), Cl_2(71), O_2(32), CO_2(44)$$

The order of increasing rate of effusion is:

A) $F_2 < Cl_2 < CO_2 < O_2$

B) $Cl_2 < F_2 < CO_2 < O_2$

C) $Cl_2 < O_2 < F_2 < CO_2$

D) $CO_2 < O_2 < F_2 < Cl_2$

E) $Cl_2 < CO_2 < F_2 < O_2$

7. The volume of a certain amount of a gas in 8.80 L at 127°C and at pressure of 2.00 atm. Calculate its volume at 27°C and 6.00 atm.

A) 6.60 L

B) 4.40 L

C) 3.30 L

D) 2.64 L

E) 2.20 L

8. If ideal gas behaviour is assumed, what is the density of Argon (M.W = 39.95) at STP (0°C & 1 atm) in g/L?

A) 1.781

B) 448

C) 1.11

D) 0.009

E) 0.901

9. A 0.10-gram sample of a diatomic gas occupies a volume of 0.202 L at 0.789 atm and a temperature of 546 K. What is the molar mass in g/mol of the gas sample?

A) 32

B) 45

C) 28

D) 38

E) 44

10. Determine the molar mass of a gas if 0.401 L weighs 1.55 g at STP?
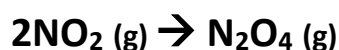
A) 69.3 g/mol

B) 94.5 g/mol

C) 86.7 g/mol

D) 53.3 g/mol

E) 43.3 g/mol

11. In the following chemical reaction, if 20.0 mL of NO_2 gas is completely converted to N_2O_4 gas under the same conditions, what volume (in mL) will N_2O_4 occupy? Assume an ideal gas behaviour.

$$2NO_2 \text{ (g)} \rightarrow N_2O_4 \text{ (g)}$$

A) 20.0

B) 10.0

C) 40.0

D) 15.0

12. Calculate the density (in g/L) of SO_2 gas (molar mass = 64.1 g/mol) at STP conditions.

A) 4.11

B) 3.31

C) 2.05

D) 1.52

E) 2.86

13. According to kinetic molecular theory, which of the following statements is correct?

A) at same temperature, gases with larger molar masses have lower average kinetic energies.

B) the volume by an ideal gas particles can't be neglected.

C) the pressure of the gas is due to the collisions of the gas particles with the walls of the container.

D) ideal gas particles repel each other, but don't attract each other.

14. If 0.10 mole of I_2 (M.W = 253.8) vapor can effuse from an opening in a heated vessel in 39 seconds. How long will it take 0.10 mole of H_2 (M.W = 2.016) to effuse under the same conditions?

A) 9.5 s

B) 3.5 s

C) 1.8 s

D) 5.3 s

E) 15.3 s

15. Calculate the root mean square velocity (u_{rms}) in (m/s) of CO_2 molecules in a sample of CO_2 gas at 1.0°C.
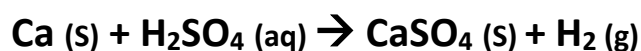
(molar mass of CO_2 = 44.0 g/mol)

A) 394.2

B) 44.0

C) 1.24

D) 39.2

E) 12.5

16. Calculate the mass of Calcium (in g) that must be dissolved in sulfuric acid in order to obtain 500 mL of hydrogen gas at 20°C and 770 mmHg (molar mass of Ca = 40.08 g/mol).

$$Ca_{(S)} + H_2SO_{4 (aq)} \rightarrow CaSO_{4 (S)} + H_{2 (g)}$$

A) 1.38 g

B) 0.0425 g

C) 1.24 g

D) 0.84 g

E) 1.13 g

17. The standard temperature and pressure (STP) refers to:

A) 237 K & 1 pascal

B) 298 K & 1 atm

C) 298 K & 1 mmHg

D) 273 K & 1 atm

E) 0°C & 1 atm

18. A mixture of 0.100 g H_2 (molar mass = 2.02 g/mol) and 0.200 g He (molar mass = 4.00 g/mol) is placed in a 10.0 L container at 2°C. Calculate the total pressure inside the container in atm.

A) 0.113

B) 0.225

C) 0.150

D) 0.257

E) 0.450

19. Which of the following is a wrong statement?

A) H_2 gas behaves more ideally than CO_2 gas

B) CO_2 (44 g/mol) effuses faster than N_2 gas (28 g/mol) at STP

C) average kinetic energy depends only on temperature

D) none of the above is wrong

20. A sample of CO gas has pressure of 58 mmHg and volume of 155 mL. When the CO is transferred to a 1.00 L flask at the same temperature the pressure of the gas in (mmHg) will be?
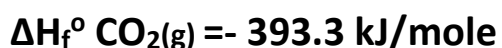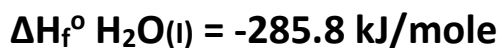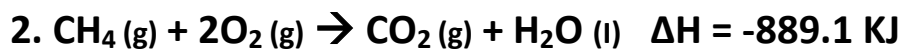
A) 4.34

B) 8990

C) 8.99

D) 111

CHAPTER 6

1. Calculate the enthalpy value for:

NO $_{(g)}$ + ½ O$_2$ $_{(g)}$ → NO$_2$

Using: ½ N$_2$ + O$_2$ $_{(g)}$ → NO $_{(g)}$ ΔH^o = +90.37 kJ
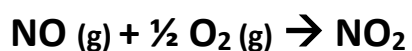
A) 56.57 kJ

B) 124.17 kJ

C) -56.57 kJ

D) -124.17 kJ

E) 213 kJ

2. CH$_4$ $_{(g)}$ + 2O$_2$ $_{(g)}$ → CO$_2$ $_{(g)}$ + H$_2$O $_{(l)}$ ΔH = -889.1 KJ

ΔH$_f^o$ H$_2$O$_{(l)}$ = -285.8 kJ/mole

ΔH$_f^o$ CO$_{2(g)}$ =- 393.3 kJ/mole

What is the standard heat of formation of methane ΔH$_f^o$ CH4$_{(g)}$ in kJ/mol as calculated from the data above?

A) -210

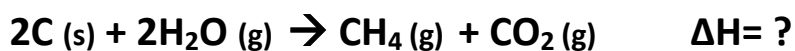**B) -107.5**

C) -75.8

D) 75.8

E) 210

3. Use the given standard enthalpies of formation to calculate the heat released per gram Fe_2O_3 (s).
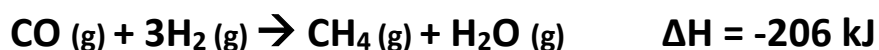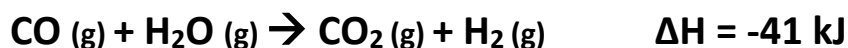
(molar mass of O = 16.00 and Fe = 55.85 g/mol).

$$3Fe_2O_3 \text{ (s)} + CO \text{ (g)} \rightarrow 2Fe_3O_4 \text{ (S)} + CO_2 \text{ (g)}$$

A) -98.5 kJ/g

B) 98.5 kJ/mol

C) -101.9 J/g

D) -98.5 J/g

E) +101.9 J/g

4. For the following reaction:

$$2C \text{ (s)} + 2H_2O \text{ (g)} \rightarrow CH_4 \text{ (g)} + CO_2 \text{ (g)} \qquad \Delta H= ?$$

Use the following information to find ΔH:

$CO \text{ (g)} + H_2 \text{ (g)} \rightarrow C \text{ (s)} + H_2O \text{ (g)}$ $\Delta H = -131$ kJ

$CO \text{ (g)} + H_2O \text{ (g)} \rightarrow CO_2 \text{ (g)} + H_2 \text{ (g)}$ $\Delta H = -41$ kJ

$CO \text{ (g)} + 3H_2 \text{ (g)} \rightarrow CH_4 \text{ (g)} + H_2O \text{ (g)}$ $\Delta H = -206$ kJ

A) -378 KJ

B) 116KJ

C) 15 KJ

D) -116 KJ

E) -372 KJ

5. Using the information below, calculate ΔH_f^o for PbO (s) in kJ/mol:

PbO (s) + CO (g) → Pb (s) + CO (g) ΔH_{rxn}^o = -131.4 kJ/mol
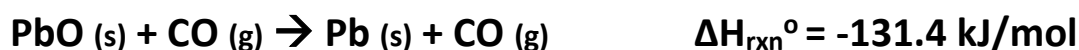
Molecules	ΔH_f^o (kJ/mol)
CO(g)	-110.5
CO₂(g)	-393.5

A) -413.9 kJ

B) -151.6 kJ

C) +372.1 kJ

D) +413.9 kJ

E) -372.1 kJ

6. When 3.50 g of sucrose undergoes combustion in a constant volume calorimeter, the temperature rises from 25.00°C to 29.00°C. Calculate ΔH for the combustion of sucrose in (KJ/mol) sucrose. The heat capacity of the calorimeter is 3.7 kJ/°C.

(The molar mass of sucrose is 342.3 g/mol)

$$C_{12}H_{22}O_{11} \text{ (s)} + 12O_2 \text{ (g)} \rightarrow 12CO_2 \text{ (g)} + 11H_2O \text{ (l)}$$
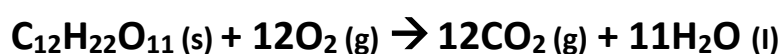
A) -5.07 * 10^3

B) -1.45 * 10^3

C) +1.45 * 10^3

D) -1.48 * 10^3

E) +1.48 * 10^1

7. When 500 ml of 0.400 M $Ca(NO_3)_2$ is added to 500 mL of 0.800 M NaF ,CaF_2 precipitates, as shown in the net ionic equation below the initial temperature of both solutions is 20.00°C assuming that the resulting solution has a mass of 1000.00 g and a specific heat of 4.18 J/(g.°C). Calculate the final temperature of the solution.

$$Ca_{2\ (aq)} + 2F^-_{(aq)} \rightarrow CaF_{2\ (s)} \qquad \Delta H^\circ = -11.5\ kJ$$

A) 18.90°C

B) 20.00 °C

C) 19.45°C

D) 20.55°C

E) 21.10°C

8. What is the kinetic energy of mole of CO_2 at 200 k (in kJ)?

A) 200 KJ

B) 4.14 * 10^{-2} KJ

C) 2.5 * 10^{-2} KJ

D) 0.200 KJ

E) 2.49 KJ

9)Given the following data:

	$\Delta H(KJ)$

$N_{2\ (g)} + 3/2\ O_{2\ (g)} \rightarrow N_2O_3$ 83.7

$N_{2\ (g)} + O_{2\ (g)} \rightarrow 2NO_{(g)}$ 180.4

$\frac{1}{2}\ N_{2\ (g)} + O_{2\ (g)} \rightarrow NO_{2\ (g)}$ 33.2

Find H for this reaction:

$NO_{2\ (g)} + NO_{(g)} \rightarrow N_2O_3$

A) -19.7

B) -59.7

C) 49.7

D) -29.7

E) -39.7

10. Given the following data:

$$2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l)$$

ΔH_f° (KJ/mol):   ?   +   +49 $\rightarrow$ -393.51 +   -285.83
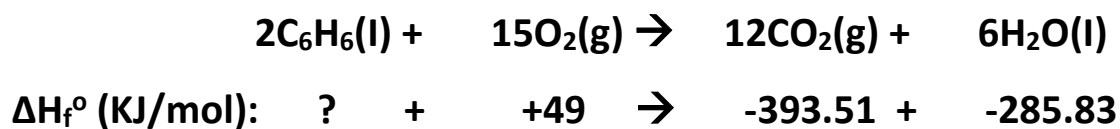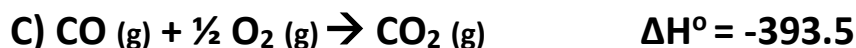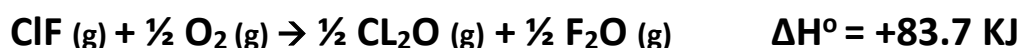
Calculate the standard enthalpy of combustion of benzene in (kJ/mole benzene):

A) -3135.5

B) 6535.2

C) -6270.9

D) -3267.6

E) -6535.2

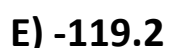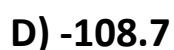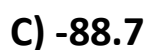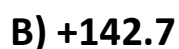**11. Given that ΔH_f^o for CO_2 (g) = -393.5 kJ/mol. Which of the following thermochemical equations is correct?**

A) C (S, graphite) + O_2 → CO_2 (g) ΔH^o = -393.5

B) C (S, graphite) + 2O → CO_2 (g) ΔH^o = -393.5

C) CO (g) + ½ O_2 (g) → CO_2 (g) ΔH^o = -393.5

D) C (l) + O_2 (g) → CO_2 (g) ΔH^o = -393.5

E) C (g) + O_2 (g) → CO_2 (g) ΔH^o = -393.5
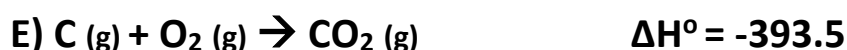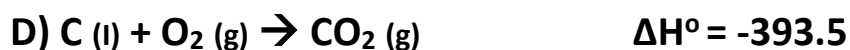
12. Consider the following thermochemical equations at 25ºC:

ClF (g) + ½ O_2 (g) → ½ CL_2O (g) + ½ F_2O (g) ΔH^o = +83.7 KJ

Cl_2O (g) + 3F_2O (g) → 2ClF_3 (g) + 2O_2 (g) ΔH^o = -341.4 kJ

2F_2 (g) + O_2 (g) → 2F_2O (g) ΔH^o = -43.4 KJ

Calculate ΔH^o (in kJ) at 25ºC for this reaction:

ClF (g) + F_2 (g) → CLF_3 (g)

A) -98.7

B) +142.7

C) -88.7

D) -108.7

E) -119.2
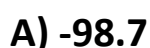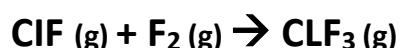
13. When 27.6 mL of 0.870 M Lead (II) nitrate reacts with 90.0 mL of 0.777 M sodium chloride 0.297 KJ of heat is released at constant pressure what is ΔH° for this reaction?

$$Pb(NO_3)_2 \text{ (aq)} + 2NaCL \text{ (aq)} \rightarrow PbCL_2 \text{ (s)} + 2NaNO_3 \text{ (aq)}$$
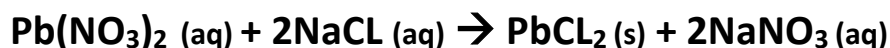
A) 11.6 kJ

B) -69.7 kJ

C) 69.7 kJ

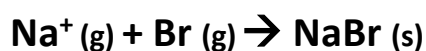D) -11.6 kJ

E) 17.4 kJ

14) Given the following data:

Sublimation energy of Na = +108 kJ/mol

First ionization energy of Na = +496 kJ/mol

Electron affinity for Br = +325 kJ/mol

Bond dissociation energy for Br_2 = +196 kJ

 Calculate ΔH_f^o for the process (in kJ) for this reaction:

$$Na^+ \text{ (g)} + Br \text{ (g)} \rightarrow NaBr \text{ (s)}$$

A) +562

B) -861

C) -735

D) -1253

E) +735

15. What is the standard enthalpy of formation of liquid n-butanol $CH_3CH_2CH_2CH_2OH$?

$CH_3CH_2CH_2CH_2OH_{(l)} + 6O_{2\ (g)} \rightarrow 4CO_{2\ (g)} + 5H_2O_{(l)}$　　　$\Delta H = -2575$

substance	$\Delta H^\circ f$ (kJ/mol)
H_2O (l)	-285.8
CO_2 (g)	-393.5

A) -528 kJ

B) -428 kJ

C) -328 kJ

D) -753 kJ

E) -603 kJ

16. Which of the following is not a state function?

A) internal energy

B) volume

C) enthalpy

D) pressure

E) work

17. A system that does not work but which transfers heat to the system has:

A) q < 0 and ΔU > 0

B) q > 0 and ΔU < 0

C) q > 0 and ΔU > 0

D) q < 0 and ΔU < 0

E) q < 0 and ΔU = 0

18. A gas is allowed to expand, at constant temperature from a volume of 4.0 L to 7.0 L against external pressure of 1.20 atm. If the gas absorbs 450 J of heat from the surrounding, then ΔE in J:

A) -85

B) +207

C) -907

D) +85

E) -20

19. A system absorbs 25.8 kJ of heat while performing 10.9 kJ of work on the surroundings. If the final internal energy U is 70.8 kJ What is the initial value of U?

A) 65.9 kJ

B) 45.9 kJ

C) 75.9 kJ

D) 55.9 kJ

E) 89.7 KJ

20. Calculate ΔHᵒ for the following reaction.

$$4NH_3 \text{ (g)} + 5O_2 \text{ (g)} \rightarrow 4NO \text{ (g)} + 6H_2O \text{ (g)}$$

ΔHᵒf NH_3 (g) = -45.9 kJ/mol

ΔHᵒf NO (g) = 90.3 kJ/mol

ΔHᵒf H_2O (g) = -241.8 kJ/mol

A) 197.4 kJ

B) -197.4 kJ

C) -105.6 KJ

D) -906.0 KJ

E) 906.0 kJ

بسم الله الرحمن الرحيم

(وَهُوَ الَّذِي جَعَلَكُمْ خَلَائِفَ الْأَرْضِ وَرَفَعَ بَعْضَكُمْ فَوْقَ بَعْضٍ دَرَجَاتٍ لِّيَبْلُوَكُمْ فِي مَا آتَاكُمْ ۗ إِنَّ رَبَّكَ سَرِيعُ الْعِقَابِ وَإِنَّهُ لَغَفُورٌ رَّحِيمٌ)

صدق الله العظيم