• General Chemistry (101) · Midterm Exam «The University of Jordan»

1. If matter is uniform throughout and cannot be separated into other substances by physical processes, but can b decomposed into other substances by chemical processes, it is called a (an)

A) heterogeneous mixture B) element C) homogeneous mixture D) compound E) mixture of elements

2. Give the correct number of significant figures for the following mathematical operation $(2.50 - 0.100)/1.10$

A) 2.2 B) 2. C) 2.18 D) 2.182 E) 2.1818

3. Convert 1000. ft/hr to m/s ? (1 ft = 0.3048 m , 1 hr = 3600 s)

A) 0.007060 B) 0.02450 C) 0.08467 D) 0.00106 E) 0.01220

4. The name of the following compound V_2O_3 is

A) vanadium (III) oxide B) vanadium oxide C) vanadium (II) oxide D) vanadium (III) trioride E) divanadium trioxide

5. What is the coefficient of HNO_3 when the following equation is properly balanced with the smallest set of whole numbers :-

$$Cu(s) + HNO_{3(aq)} \longrightarrow Cu(NO_3)_{2(aq)} + NO(g) + H_2O_{(L)}$$

A) 3 B) 8 C) 6 D) 12 E) 4

6. How many moles of Na_2SO_4 are contained in a 35.0-g sample of this substance ?

A) 0.292 mol B) 0.990 mol C) 0.278 mol D) 2.16 mol E) 0.246 mol

7. A 2.50 g of $C_7H_6O_3$ (138.12 g/mol) is reacted with 10.31 g of CH_3OH (32.04 g/mol) according to the following reaction: $C_7H_6O_3 + CH_3OH \longrightarrow C_8H_8O_3 + H_2O$. The yield of $C_8H_8O_3$ (152.14) g/mol) is 1.27 g. what is the percentage yield. $C_8H_8O_3$

A) 46.1 % B) 32.4 % C) 75.0 % D) 71.3 % E) 23.05 %

8. What is the mass of one atom of zinc in grams ? ($N_A = 6.022 \times 10^{23}$)

A) 6.35×10^{-22} B) 3.20×10^{-22} C) 5.89×10^{-22} D) 1.09×10^{-22} E) 4.05×10^{-22}

9. An organic compound contains by mass. Its composition is 68.85% C, 4.95% H, 26.2% O, and its molecular weight is 122.12 g/mol . What is its molecular formula ?

A) $C_4H_8O_2$ B) $C_7H_6O_2$ C) $C_{18}H_{28}O_2$ D) $C_{25}H_{12}O_2$ E) $C_{18}H_{36}O_2$

10. How many moles of C_3H_8 that contain 3.17×10^{25} of hydrogen atoms ? ($N_A = 6.022 \times 10^{23}$)

A) 8.22 mol B) 6.58 mol C) 1.03 mol D) 3.09 mol E) 9.73 mol

11. Which one of the following substances is a weak electrolyte ?

A) Ne B) NaOH C) NH_3 D) $C_6H_{12}O_2$ E) CH_3OH

12. Which of the following is an oxidation-reduction reaction ?

A) $CaCl_{2(aq)} + FeSO_{4(aq)}$ B) $Fe(s) + H_2SO_{4(aq)}$ C) $NaOH_{(aq)} + HC_2H_2O_{2(aq)}$

D) $(NH_4)_2SO_{4(aq)} + CaCl_{2(aq)}$ E) $Mg(NO_3)_{2(aq)} + CsBr_{(aq)}$

13. The net ionic equation for the reaction between aqueous NH_3 and HBr is

A) $HBr + NH_3 \longrightarrow NH_4Br$ B) $H^+ + OH^- \longrightarrow H_2O$ C) $HBr + OH^- \longrightarrow Br^- + H_2O$

D) $H^+ + NH_3 \longrightarrow NH_4^+$ E) $H^+ + Br^- + NH_3 \longrightarrow NH_4^+ + Br^-$

14. An excess of Na_2CO_3 was added to a 100.0-ml sample of the water containing Pb ions. The mass of $PbCO_3$ (26 g/mol) that precipitated was 0.1443 g. What was the mass of Pb^{2+} (207.2 g/mol) in the original sample ?

A) 0.1120 g B) 11.80 g C) 0.3855 g D) 0.001443 g E) 185.1 g

15. If you have 25.0 ml of 13.5 M HNO_3 solution. what is the final concentration when diluted to 500. ml ?

A) 0.270 M B) 1.48 M C) 0.958 M D) 0.439 M E) 0.675 M

Good Luck ☺

• Answers :-

1. D
2. C
3. C
4. A
5. B
6. E
7. A
8. D
9. B
10. B
11. C
12. B
13. D
14. A
15. E

١) لا يحكيلي cannot be separated by physical process معناها بستبعد كل ال mixtures .

hetero homo

بالتالي بظل عند element , compound

element: cannot broken down into simpler substances by chemical process

compound: بالسؤال مذكور إنه (يمكن تقسيمه من خلال العمليات الكيميائية)

عشان هيك الجواب Compound (D)

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٢) $(2.50 - 0.100) / 1.10$

2 dim 3 dim

$(2.40 / 1.10)$

3 sig fig 3 sig fig

$= 2.18$

3 sig fig

2.18 (C)

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٣) $\frac{1000 \text{ ft}}{\text{hr}} * \frac{1 \text{ hr}}{3600 \text{ s}} * \frac{0.3048 \text{ m}}{1 \text{ ft}}$

$= 0.08467$ (C)

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٤) V_2O_3

Vanadium (III) oxide → ionic compound

vanadium is a transition metal (B)

الجواب (A)

$$3Cu_{(s)} + 8HNO_{3(aq)} \rightarrow 3Cu(NO_3)_{2(aq)} + 2NO_{(g)} + 4H_2O_{(l)}$$

coefficient of HNO_3 is 8

(B) الجواب

(٦

no of moles Na_2SO_4 = mass / Molar mass

Molar mass Na_2SO_4 = $2*23 + 1*32 + 4*16$ = 142 g/mol

= $\frac{35\,g}{142\,g/mol}$ = 0.246 mol

(E) الجواب

(٧

$$C_7H_6O_3 + CH_3OH \rightarrow C_8H_8O_3 + H_2O$$

* أعطاني معلومتين لمادتين وتفاعلات وشو المعلومات يمكن ايجاد عدد المولات منها بالتالي السؤال عن ال Limiting reactant

$C_7H_6O_3$: $n = \frac{2.50\,g}{138.12\,g/mol} = 0.018\,mol\ C_7H_6O_3$ $\xrightarrow{\text{نحولها الى مولات } C_8H_8O_3}$ $0.018\,mol\ C_8H_8O_3$ (1:1)

CH_3OH : $n = \frac{10.31\,g}{32.04\,g/mol} = 0.32\,mol\ CH_3OH$ $\xrightarrow{\text{نحولها الى مولات } C_8H_8O_3}$ $0.32\,mol\ C_8H_8O_3$ (1:1)

* المادة ال Limiting reactant هي $C_7H_6O_3$ بسبب احتوائها على أقل عدد مولات.

Theoritical yield (mass of $C_8H_8O_3$) = moles of $C_8H_8O_3$ * Molar mass = 0.018 mol * 152.14 = **2.74 g**

so, percent yield = $\frac{\text{Actual yield}}{\text{Theoritical yield}} * 100\% = \frac{1.27}{2.74} * 100\% = 46.4\%$

(A) الجواب

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$$\text{no. of moles} = \frac{1 \text{ atom Zn}}{(6.023 \times 10^{23})}$$

$$= 1.66 \times 10^{-24} \text{ mol Zn}$$

$$\text{mass Zn} = \text{moles Zn} \times \text{Molar mass Zn}$$

$$= 1.66 \times 10^{-24} \times 65.38$$

$$= 1.08 \times 10^{-22} \text{ g}$$

الجواب (D)

(٩

$C_{68.35\%}$ $H_{4.95\%}$ $O_{26.2\%}$

* نفرض أن 100 g = 100% ∴

$C_{68.35g}$ $H_{4.95g}$ $O_{26.2g}$

* نحول إلى عدد مولات :-

$C_{\frac{68.35}{12}}$ $H_{\frac{4.95}{1}}$ $O_{\frac{26.2}{16}}$

$C_{5.73}$ $H_{4.95}$ $O_{1.63}$

* نقسم على أقل عدد مولات .

$C_{\frac{5.73}{1.63}}$ $H_{\frac{4.95}{1.63}}$ $O_{\frac{1.63}{1.63}}$

$C_{3.5}$ H_3 O_1

يجب أن تحتوي على أرقام صحيحة.

2 ← formula ذلك نضرب كل الـ

C_7 H_6 O_2 ← empirical formula

* لإيجاد الـ molecular formula نوجد n :-

$$n = \frac{\text{M.w of Molecular}}{\text{M.w of empirical}}$$

$$= \frac{122.12}{(7\times12 + 6\times1 + 2\times16)} = 1$$

so, empirical formula ≡ molecular formula

الجواب (B)

n = 1 أي

10)

$$\text{no. of moles of H} = \frac{3.17 \times 10^{25}}{(6.023 \times 10^{23})}$$

$$= 52.6 \text{ mol of H}$$

1 mol C_3H_8 ——— 8 mol H

x ——→ 52.6 mol H

$$x = \frac{52.6}{8} = 6.58 \text{ mol } C_3H_8$$

الجواب (B)

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11) weak electrolyte → NH_3

الجواب (C)

ال Ne عنصر (element) ولا يمكن تفسيره للأيونات .

ال CH_3OH و $C_6H_{12}O_6$ (non electrolytes)

ال NaOH ← strong - electrolyte

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١٢) كل التفاعلات هي precipitation reaction (تفاعلات ترسيب) بسبب تفاعل two ionic substances مع بعض والتفاعل (C) هو Acid-base reaction

لذلك التفاعل (B) هو oxidation-reduction reaction

$$\overset{0}{Fe}_{(s)} + \overset{+1}{H_2}S\overset{-2}{O_4} \longrightarrow \overset{0}{H_2} + \overset{+2}{Fe}S\overset{-2}{O_4}$$

(أيضا هو من أقسام التفاعلات كما ذكرنا في دوسية الابداع في الكيمياء التي تعرض ال redox rxns)

net ionic equation (1W

For $NH_3 + HBr$.

molecular equation

$$NH_{3(aq)} + HBr_{(aq)} \longrightarrow NH_4^+{}_{(aq)} + Br^-{}_{(aq)}$$

complete ionic equation

$$NH_{3(aq)} + H^+ + \cancel{Br^-} \longrightarrow NH_4^+ + \cancel{Br^-}$$

ضعيفة لا تتفكك بشكل كبير.

net ionic equation

$$NH_{3(aq)} + H^+ \longrightarrow NH_4^+$$

الجواب (D)

$$Na_2CO_3 + Pb^{+2} \longrightarrow PbCO_3 + 2Na^+$$ (1E

mass of $PbCO_3$ = 0.1443 g $\longrightarrow$ no. of moles of $PbCO_3$ = $\frac{0.1443\ g}{267.0}$

$= 5.4 \times 10^{-4}$ mol $PbCO_3$

1 mol $PbCO_3$ $\longrightarrow$ 1 mol Pb^{+2}

5.4×10^{-4} mol $PbCO_3$ — x $\longrightarrow$ $x = 5.4 \times 10^{-4}$ mol Pb^{+2}

(1:1)

mass of Pb^{+2} = 5.4×10^{-4} mol $\times$ 207.2

= 0.112 g Pb^{+2}

الجواب (A)

diluting solution (10

$$M_i * V_i = M_f * V_f$$

$$M_f = \frac{M_i * V_i}{V_f} = \frac{13.5 * 25\ \text{ml}}{500\ \text{ml}}$$

$$= 0.675\ M$$

الجواب (E)