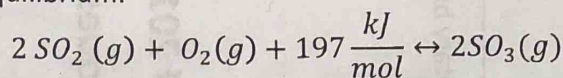


Semester 2 Final Review
Free Response Part 2

20

1. Consider the following equilibrium:



- a. The reaction is ENDO ^{+0.5} thermic and $\Delta H =$ 197 kJ/mol ^{+0.5}
- b. Which substances would have a heat of formation of zero? O₂ ^{+0.5}
- c. Give the direction of the shift for each of the following:
- i. Increase temperature \rightarrow ^{+0.5}
 - ii. Increase [SO₂] \rightarrow ^{+0.5}
 - iii. Increase volume \leftarrow ^{+0.5}
 - iv. Decrease [O₂] \leftarrow ^{+0.5}
 - v. Increase pressure \rightarrow ^{+0.5}

d. Write the K_{eq} expression for the equilibrium.

$$K_{eq} = \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2 [\text{O}_2]} \quad +1$$

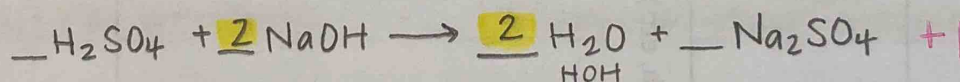
e. Calculate the value of the K_{eq} if at equilibrium

[SO₂]=0.20 M, [O₂]=0.028 M, and [SO₃]=0.56 M

$$= \frac{[0.56]^2}{[0.20]^2 [0.028]} \quad K_{eq} = \underline{280} \quad +1$$

2. Sulfuric acid reacts with sodium hydroxide.

a. Give the balanced equation for this reaction.



b. If 20.00 mL of sodium hydroxide react with 40.00 mL of 0.050 M sulfuric acid, what is the concentration of sodium hydroxide?

$$(0.050 \text{ M})(0.04000 \text{ L}) = 2.0 \times 10^{-3} \text{ mol H}_2\text{SO}_4$$

$$2.0 \times 10^{-3} \text{ mol H}_2\text{SO}_4 \times \frac{2 \text{ mol NaOH}}{1 \text{ mol H}_2\text{SO}_4} = \frac{4.0 \times 10^{-3} \text{ mol NaOH}}{0.02000 \text{ L}} = \underline{0.20 \text{ M NaOH}} \quad +1$$

c. What mass of the salt is produced?

$$2.0 \times 10^{-3} \text{ mol H}_2\text{SO}_4 \times \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} \times \frac{142.04 \text{ g Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} = \underline{2.8 \text{ g Na}_2\text{SO}_4} \quad +1$$

d. What is the pH of the sulfuric acid?



$$\text{pH} = -\log(0.10) = 1$$

11

Name: _____ Per _____

3. A flask contains 672 mL of F_2O at STP.

a. Calculate the moles present.

$$0,672 \text{ L } F_2O \times \frac{1 \text{ mol}}{22,4 \text{ L}} = 0,0300 \text{ mol}$$

$$= \underline{0,0300 \text{ mol}} +1$$

b. Calculate the mass present.

$$0,0300 \text{ mol } F_2O \times \frac{54,00 \text{ g } F_2O}{1 \text{ mol } F_2O} = 1,62 \text{ g}$$

$$= \underline{1,62 \text{ g } F_2O} +1$$

c. Calculate the molecules present.

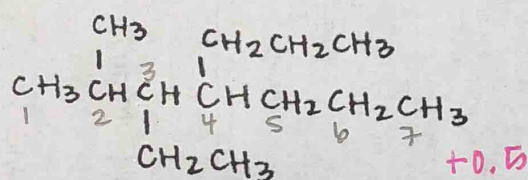
$$0,0300 \text{ mol} \times \frac{6,02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} =$$

$$= \underline{1,81 \times 10^{22}} +1$$

molecules

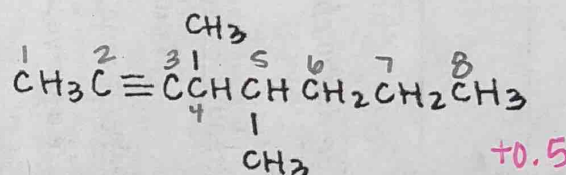
4. Name each of the following molecules.

a.



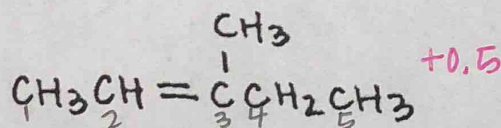
3-ethyl-2-methyl-4-propylheptane

b.



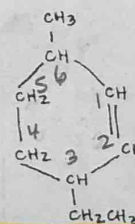
4,5-dimethyl-2-octyne

c.



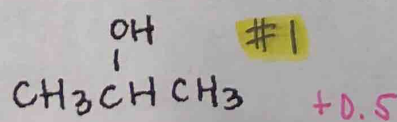
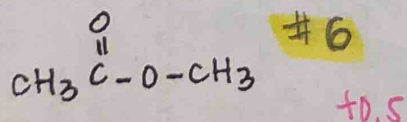
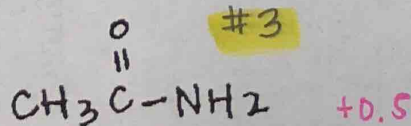
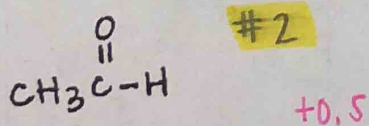
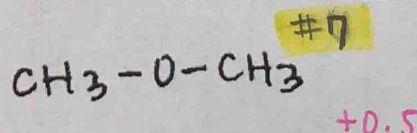
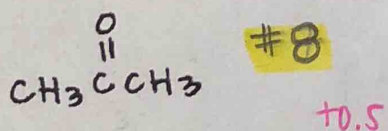
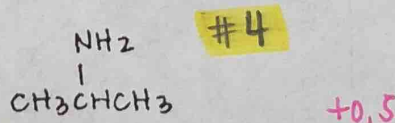
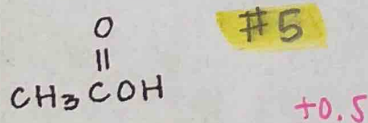
3-methyl-2-pentene

d.



3-ethyl-6-methyl-1-cyclohexene

5. Match each molecule with its functional group.



Functional Groups:

- 1) Alcohol
- 2) Aldehyde
- 3) Amide
- 4) Amine
- 5) Carboxylic acid
- 6) Ester
- 7) Ether
- 8) ketone