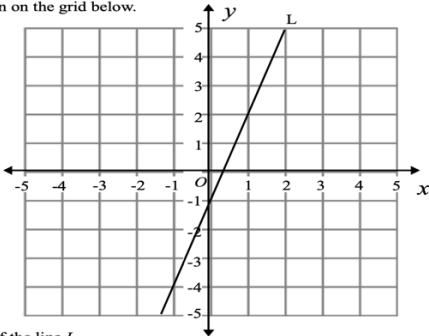



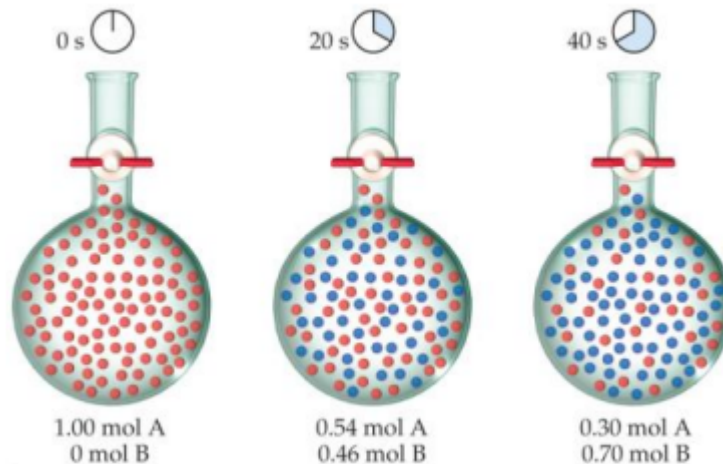
G11 EoT2 LOs Examples

| | LOs | Examples | Question | Page |
|----|---|---|----------|------|
| 1. | Define a solution | Define a solution. | pdf | pdf |
| | | Which of the following pairs of liquids will give a solution? (a) Oil and water (b) Kerosene and water (c) Ethanol and water | pdf | pdf |
| 2. | Describe the process of an ionic compound dissolving in water using the terms solute, solvent and solution | Describe the process of an ionic compound dissolving in water using the terms solute, solvent and solution | pdf | pdf |
| 3. | Carry out unit conversion | Calculate the number of moles in 15g of sodium chloride (NaCl) | pdf | pdf |
| | | Convert the following milliliters into liters: (i) 1300 ml = (ii) 3250 ml = | pdf | pdf |
| 4. | Calculate molarity of a given solution | What is the molarity when 1.0 mole of potassium fluoride is dissolved in 100mL of solution. | pdf | pdf |
| | | What is the molarity of a solution of HNO ₃ that contains 12.6 grams HNO ₃ in 500mL of solution? | pdf | pdf |
| 5. | Recall that solubility of ionic substances in a solvent depend on intermolecular interactions between particles | Which of the following mixture will give a solution: 1. NaCl in water 2. NaCl in hexane? Explain your answer | pdf | pdf |
| 6. | List the factors that affect the rate of a reaction | List the factors that affect the rate of a reaction | pdf | pdf |

| | | | | | | | | | | | | |
|----|---|--|-----|-----|----|----|----|---|----|----|----|----|
| 7. | Explain how temperature/concentration affect the rate of a reaction | Explain how a change in temperature affects the rate of a reaction. | pdf | pdf | | | | | | | | |
| | | Explain how a change in concentration affects the rate of a reaction. | pdf | pdf | | | | | | | | |
| 8. | Calculate an average given relevant data | <p>Khaled measured the mass of a sample of magnesium 5 times and obtained the following results:</p> <p>13.4g; 13.1g; 13.0g; 12.9g; 13.3g</p> <p>Calculate the average mass of the sample.</p> | pdf | pdf | | | | | | | | |
| | | <p>The table below shows the exam scores of 10 students.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>76</td> <td>63</td> <td>77</td> <td>71</td> <td>81</td> </tr> <tr> <td>0</td> <td>54</td> <td>93</td> <td>47</td> <td>82</td> </tr> </table> <p>Calculate the average score.</p> | 76 | 63 | 77 | 71 | 81 | 0 | 54 | 93 | 47 | 82 |
| 76 | 63 | 77 | 71 | 81 | | | | | | | | |
| 0 | 54 | 93 | 47 | 82 | | | | | | | | |
| 9. | Calculate the gradient of a line | <p>The line L is drawn on the grid below.</p>  <p>Find the gradient of the line L.</p> | pdf | pdf | | | | | | | | |
| | | Find the gradient of the curve at $T = 40$ | pdf | pdf | | | | | | | | |

| | | | | |
|-----|--|--|------|-----|
| | | | | |
| 10. | Understand the concept of stoichiometry | <p>The balanced equation for the decomposition of aluminum oxide, Al_2O_3, is given in the balanced chemical equation below:</p> $2\text{Al}_2\text{O}_3(\text{s}) \rightarrow 4\text{Al}(\text{s}) + 3\text{O}_2(\text{g})$ <p>How many moles of aluminum oxide were used?</p> <p>How many moles of oxygen were produced?</p> | pdf | pdf |
| | | <p>Carbon tetrachloride, CCl_4 can be produced by reacting chlorine with methane according to the equation:</p> $\text{CH}_4(\text{g}) + 4\text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{l}) + 4\text{HCl}(\text{g})$ <p>How many moles of CCl_4 can be produced from 8 moles of Cl_2 gas?</p> | pdf | pdf |
| 11. | Describe saturated, unsaturated, and supersaturated as they pertain to solutions. (Section 12.1) | Distinguish between an unsaturated solution, a saturated solution, and a supersaturated solution. | 12.1 | 545 |
| 12. | Summarize the three types of interactions that determine the extent to which a solute dissolve | Describe the factors that affect the solubility of a solid in a liquid. What does it mean to say that two liquids are miscible? | 12.6 | 545 |
| | | What is solvation? What factors influence the extent to which solvation occurs? | 12.5 | 545 |

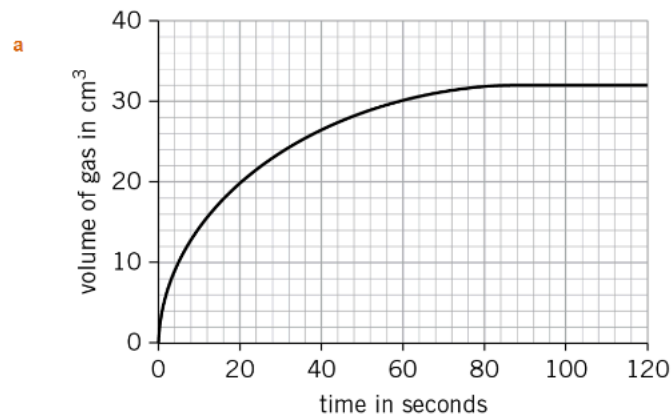
| | | | | |
|-----|---|--|--------------|-----|
| | in solution. (Section 12.2) | | | |
| 13. | Apply the various concentration units to express the concentration of a given solution or to interchange concentration units (Section 12.3) | Sea water contains roughly 28.0 g of NaCl per liter. What is the molarity of sodium chloride in sea water? | pdf | pdf |
| | | What is the molarity of a solution made by dissolving 3.00 moles of NaCl in enough water to make 6.00 liters of solution? | pdf | pdf |
| 14. | Appraise the effect of temperature on solubility. (Section 12.4) | How do the solubilities of most ionic compounds in water change with temperature? | 12.25 | 546 |
| | | The solubility of KNO ₃ is 155 g per 100 g of water at 75°C and 38.0 g at 25°C. What mass (in grams) of KNO ₃ will crystallize out of solution if exactly 100 g of its saturated solution at 75°C is cooled to 25°C?  | 12.28 | 546 |
| 15. | Compute the half-life ($t_{1/2}$) of a reaction. (Section 13.3) | Define the half-life of a reaction. Write the equation relating the half-life of a first-order reaction to the rate constant. | 13.22 | 606 |
| | | The decomposition of ethane (C ₂ H ₆) to methyl radicals is a first-order reaction with a rate constant of $5.36 \times 10^{-4} \text{ s}^{-1}$ at 700°C: $\text{C}_2\text{H}_6(\text{g}) \longrightarrow 2\text{CH}_3(\text{g})$ Calculate the half-life of the reaction in minutes. | Example 13.6 | 577 |
| 16. | Evaluate the average rate of a reaction given appropriate data. (Section 13.1) | Distinguish between average rate and instantaneous rate. ' ' | 13.2 | 604 |
| | | | 13.7 | 604 |



- From the data in the figure above, calculate the average rate at which A disappears over the time interval from 20 s to 40 s.
- Use the data in the figure above to calculate the average rate of appearance of B over the time interval from 0 s to 40 s.

17. Infer the instantaneous rate of a reaction given a graph. (Section 13.1)

The graph below shows how much hydrogen was given off during the reaction between magnesium ribbon and hydrochloric acid.



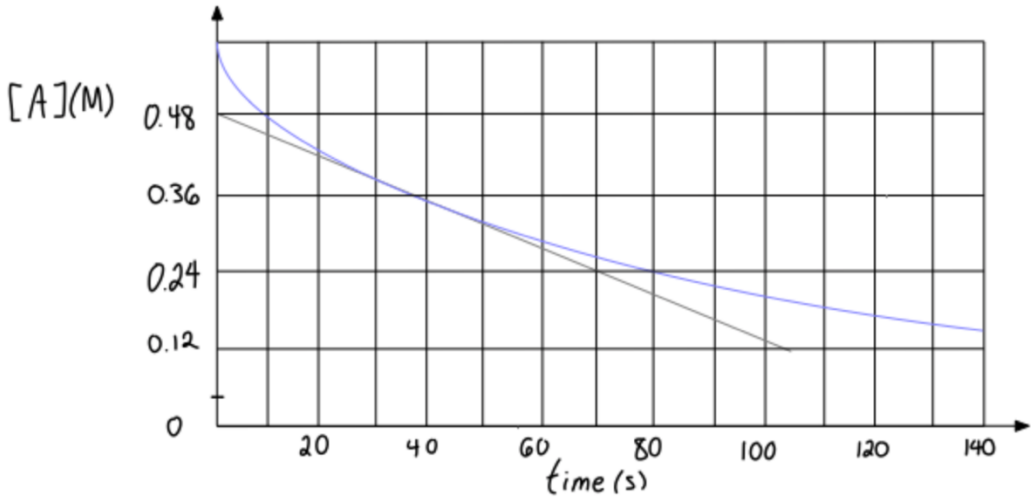
Calculate the initial rate of reaction

pdf

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| | | | | |
|-----|--|---|------|-----|
| | | <p>Given the following graph for a reactant concentration as a function of time, estimate the instantaneous rate of reaction at 40 s?</p>  | | |
| 18. | <p>Use the stoichiometry of a reaction to express the rate of a reaction in terms of a reactant or product. (Section 13.1)</p> | <p>Consider the reaction</p> $2\text{NO}(g) + \text{O}_2(g) \longrightarrow 2\text{NO}_2(g)$ <p>Suppose that at a particular moment during the reaction nitric oxide (NO) is reacting at the rate of 0.066 M/s. (a) At what rate is NO₂ being formed? (b) At what rate is molecular oxygen reacting?</p> | 13.7 | 604 |
| | | <p>Consider the reaction</p> $\text{N}_2(g) + 3\text{H}_2(g) \longrightarrow 2\text{NH}_3(g)$ <p>Suppose that at a particular moment during the reaction molecular hydrogen is reacting at the rate of 0.074 M/s. (a) At what rate is ammonia being formed? (b) At what rate is molecular nitrogen reacting? <input type="text"/></p> | 13.8 | 605 |
| 19. | | | pdf | pdf |

| 21. | Express the units of the rate constant k for a reaction. (Section 13.2) | <p>Consider the reaction</p> $A + B \longrightarrow \text{products}$ <p>From the following data obtained at a certain temperature, determine the order of the reaction and calculate the rate constant.</p> <table border="1" data-bbox="680 363 1415 548"> <thead> <tr> <th>[A] (M)</th> <th>[B] (M)</th> <th>Rate (M/s)</th> </tr> </thead> <tbody> <tr> <td>1.50</td> <td>1.50</td> <td>3.20×10^{-1}</td> </tr> <tr> <td>1.50</td> <td>2.50</td> <td>3.20×10^{-1}</td> </tr> <tr> <td>3.00</td> <td>1.50</td> <td>6.40×10^{-1}</td> </tr> </tbody> </table> | [A] (M) | [B] (M) | Rate (M/s) | 1.50 | 1.50 | 3.20×10^{-1} | 1.50 | 2.50 | 3.20×10^{-1} | 3.00 | 1.50 | 6.40×10^{-1} | pdf | pdf |
|---------|--|---|---------|---------|------------|------|------|-----------------------|------|------|-----------------------|------|------|-----------------------|-----|-----|
| [A] (M) | [B] (M) | Rate (M/s) | | | | | | | | | | | | | | |
| 1.50 | 1.50 | 3.20×10^{-1} | | | | | | | | | | | | | | |
| 1.50 | 2.50 | 3.20×10^{-1} | | | | | | | | | | | | | | |
| 3.00 | 1.50 | 6.40×10^{-1} | | | | | | | | | | | | | | |
| | | <p>What are the units for the rate constant if the rate law is: $\text{rate} = k[A][B]^2[C]$?</p> <p>a. 1/s b. 1/Ms c. 1/M²s d. M/s e. 1/M³s</p> | pdf | pdf | | | | | | | | | | | | |
| 22. | Determine the order of a reaction from its rate law. (Section 13.2) | <p>For the reaction $2A + B + 2C \rightarrow D + 2E$, the rate law is: $\text{rate} = k[A]^2[B]^1[C]^1$</p> <p>Which of the following statements is <u>false</u>:</p> <p>a. the reaction is second order in [A] b. the reaction is first order in [B] c. the reaction is second order in [C] d. the reaction is 4th order overall</p> <p>For the reaction $2A + B \rightarrow C + D$, if the concentration of A is doubled, the reaction rate doubles. If the concentration of B is halved, there is no change in the reaction rate. Determine the order of reaction with respect to each reactant and the overall order of reaction.</p> | pdf | pdf | | | | | | | | | | | | |
| 23. | Apply the integrated rate law for a reaction to find the concentration of a reactant. (Section 13.3) | <p>The half-life for a first-order reaction is 32 s. What was the original concentration if, after 2.0 minutes, the reactant concentration is 0.062 M?</p> <p>(a) 0.84 M (b) 0.069 M (c) 0.091 M (d) 0.075 M (e) 0.13 M</p> <p>For the reaction $A \rightarrow \text{product}$, the first two half-times are 10 minutes and 20 minutes respectively. At the beginning of the reaction, [A] was 0.10M. What is the [A] at $t = 80$ min?</p> | pdf | Pdf | | | | | | | | | | | | |
| | | | pdf | pdf | | | | | | | | | | | | |

Scenario Questions

The following data were collected for the reaction of $A + B \rightarrow C$

| Run | Initial [A] | Initial [B] | Initial Rate M/s |
|-----|-------------|-------------|------------------|
| 1 | 0.100 | 0.050 | 0.0400 |
| 2 | 0.200 | 0.050 | 0.0800 |
| 3 | 0.100 | 0.100 | 0.160 |

24-28 Examples refer to the above data

| | | | | |
|-----|--|--|-----|-----|
| 24. | Summarize reaction order and provide examples of a zeroth-, first-, second-order reaction rate law. (Section 13.2) | Define order of a reaction | PDF | PDF |
| | | If a reaction is second order with respect to a reactant, what would happen to the initial rate if the concentration of the reactant is doubled. | PDF | PDF |
| 25. | Write the rate law of a reaction given experimental data. (Section 13.2) | Using the data in the table, calculate the order of the reaction with respect to A. Show all your working. | PDF | PDF |
| 26. | Write the rate law of a reaction given experimental data. (Section 13.2) | Using the data in the table, calculate the order of the reaction with respect to B. Show all your working. | PDF | PDF |
| | | Determine the order of the overall reaction | PDF | PDF |
| 27. | Write the rate law of a reaction given experimental data. (Section 13.2) | Write the rate law of a reaction given. | PDF | PDF |
| 28. | Express the units of the rate constant k for a reaction. (Section 13.2) | Calculate the value of k. Show all your working. | PDF | PDF |
| | | What are the units of k? | PDF | PDF |
| 29. | ***Bonus*** | | | |

| | | | | |
|-----|-------------|--|--|--|
| 30. | ***Bonus*** | | | |
|-----|-------------|--|--|--|