

Green University of Bangladesh
Department of Computer Science and Engineering
Term test :1 , Spring' 2024

Course Code: CHE 101
Full Marks: 10

Course Title: Chemistry
Time: 25 Minutes

- ✓ 1. Provide electronic configuration of $_{29}\text{Cu}$, $_{26}\text{Fe}$, $_{21}\text{Sc}$ and $_{30}\text{Zn}$. List the d-block and transition metals from these elements? (Why) do d block element form colored compound? 4
- ✓ 2. Indicate which of the following sets of quantum numbers in an atom are unacceptable and explain why: (a) $(1, 0, 1, \frac{1}{2})$, (b) $(3, 0, 0, +\frac{1}{2})$, (c) $(2, 2, 1, +\frac{1}{2})$, (d) $(3, 2, 1, 1)$ 2
- ✓ 3. Explain the periodic trend of ionization potential and atomic radius of atoms in the periodic table. 2
- ✓ 4. State and explain Hund's rule with proper example. 2

University of Information Technology & Sciences (UITS)
Faculty of Science and Engineering
Department of CSE
CT 2

Marks 20

time :50min

1. A person is synthesizing nanoparticles for semiconductor device where he requires constant pH environment. He used buffer solution for this purpose. Describe the reaction mechanisms of acidic and basic buffer solutions to fulfil his purpose. 4
2. You need 0.5M HCl for a laboratory experiment but you have found 4M HCl in the lab. Therefore, you need to dilute the solution before use. Determine the volume of water needed to dilute 200 mL of a 4 M solution to a final concentration of 0.5M. 2
3. Red cabbage juice acts as a natural pH indicator, turning red in acidic solutions and green in basic solutions. You have three unknown solutions and a dropper. By mixing a small amount of each solution with red cabbage juice, you observe the following color changes: Solution A + cabbage juice → pink, Solution B + cabbage juice → dark purple, Solution C + cabbage juice = teal blue. Knowing that a neutral solution with cabbage juice turns purple, can you analyze the solutions from strongest acid to strongest base based on these observations? 3
4. A first order reaction takes 20 min for 15% completion. Determine the rate constant and how long it takes to 60% completion. 3
5. Most of the times, we assume that half-life of any reaction is dependent on initial concentration of the reactants. Sometimes, it appears to be false. Identify the half-life of a first-order reaction and a second-order reaction and show that one of them is not dependent on initial concentration of reactant. 4
6. A CSE student was assigned to design programming codes for a sensor to detect acids and bases. Hence, he requires theoretical explanation of acid-base to test his codes. He can use Arrhenius and Lewis Acid-Base theory. Describe those theories using the following reaction: 4

