DEPARTMENT OF CHEMISTRY
FACULTY OF PHYSICAL SCIENCES
UNIVERSITY OF BENIN, BENIN CITY
BSC. DEGREE EXAMINATION, SECOND SEMESTER, 2023/2024 SESSION
COURSE: CHM107: GENERAL PRACTICAL CHEMISTRY I
CREDIT: 2 TIME ALLOWED 2HOURS **DATE: SEPTEMBER 2024.**

INSTRUCTIONS:

- *Answer all Questions*
- *There are **five (5)** options for each question, shade the correct option with **HB PENCIL***
- *Fill in your personal details in the space provided on top of the answer sheet with **HB** pencil*
- *Shade your **OPTION TYPE** correctly*
- ***No cell phones (handset) is allowed in the examination hall***

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1. Calcium carbonate undergoes thermal decomposition at high temperatures to form calcium oxide and carbon dioxide.$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$. What mass of calcium oxide (M = 56) is formed when 60 g of calcium carbonate (M = 100) is completely decomposed? (A) 28 g (B) 18.5 g (C) 60 g (D) 33.6 g (E) 30 g
2. Calculate the molarity of concentrated hydrochloric acid, if this solution is 37.7% HCl by mass and its density is 1.195 g/mol. [H = 1.0, Cl = 35.5] (A) 11.8 M (B) 12.3 M (C) 13.3 M (D) 15.2 M (E) 16.2 M
3. How many grams of KCl would be required to prepare 0.02 molar solution of the salt [K = 39, Cl = 35.5]? (A) 1.49 g (B) 2.98 g (C) 1.59 g (D) 1.69 g (E) 0.35 g
4. How many grams of sodium dichromate $Na_2Cr_2O_7$ should be added to 100.00 ml. volumetric flask to prepare 0.025 M when the flask is filled to the mark with water? (A) 0.33 g (B) 0.55 g (C) 0.66 g (D) 0.88 g (E) 0.99 g
5. How many mL of 0.150 M H_2SO_4 as required to react with 8.20 g of $NaHCO_3$ according to the following equation? $H2SO_{4(aq)} + 2NaHCO_{3(aq)} \rightarrow 2\ Na_2SO_{4(aq)} + 2\ CO_{2(g)} + 2\ H_2O_{(l)}$ [Na = 23.0, C = 12.0, H = 1.0, O = 16.0]. (A) 162.5 mL (B) 325 mL (C) 650 ml. (D) 812.50 mL (E) 16.25 mL.
6. How many mL of the stock solution of nitric acid that is 15.8 M do you require to make 1.00 L of 0.12 M HNO_3? (A) 0.76 mL (B) 1.50 mL (C) 25.20 mL (D) 76.00 mL (E) 152.00 mL
7. In the Niger Delta environment where there is emission of gasses through combustion of natural gas, the pH of the rain water would likely be? (A) 3 (B) 5 (C) 7 (D) 7.5 (E) none of the above
8. In which of the reactions would phenolphthalein be a suitable indicator? (A) HCl and NaOH (B) CH_3COOH and NaOH (C) CH_3COOH and NH_3 (D) H_2SO_4 and KOH (E) none of the above
9. The following are suitable primary standard except? (A) NaOH (B) Na_2CO_3 (C) $K_2Cr_2O_7$ (D) NaCl (E) none of the above
10. What is the concentration in $moldm^{-3}$ of a solution of sodium hydroxide that contains 16g of NaOH in 200 cm^3 of distilled water [Na = 23, H = 1, O = 16]? (A) 2.5 (B) 2.0 (C) 0.2 (D) 1.0 (E) 0.25
11. What is the concentration of standard solution in mol/L prepared by dissolving 0.4 g of NaOH in 250 ml of water [Na = 23, H = 1, O = 16] (A) 0.4 (B) 0.04 (C) 0.02 (D) 0.004 (E) 0.002

12. What is the hydrogen ion concentration of a solution whose pH is 5.3? (A) 5.0×10^{-5} (B) 5.0×10^{-6} (C) 5.0×10^{-7} (D) 5.0×10^{-8} (E) 6.0×10^{-7}
13. What is the likely pH of a solution which contains equivalent amount of hydrochloric acid and ammonia? (A) 6 (B) 7 (C) 8 (D) 9 (E) none of the above
14. What is the molar concentration in mol/L of a standard solution prepared by dissolving 10.6 g of $NaCO_3$ in 1 litre of water [Na=23, C-12, O-16]? (A) 0.01 mol/L (B) 0.001 mol/L (C) 0.1 mol/L (D) 0.0001 mol/L (E) 0.2 mol/L
15. What volume of 0.250 M HNO_3, reacts with 44.8 ml of 0.150 M Na_2CO_3 in the following reaction? $2HNO_3 + Na_2CO_{3(aq)} \rightarrow 2NaNO_{3(aq)} + CO_{2(g)} + H_2O_{(l)}$ [Na = 23.0, N = 14.0, C = 12.0. H = 1.0, O = 16.01.(A) 13.45 ml. (B) 26.90 ml. (C) 53.80 ml. (D) 80.70 ml.(E) 30.35 ml.
16. What weight of anhydrous sodium trioxocarbonate (IV) is required to prepare 0.05 M of its solution in 250 ml. volumetric flask? (A) 0.6625 g (B) 2.65 g (C) 13.35 g)1.325 g (E) 0.1325 g
17. Which indicator is most appropriate for the determinant of the molarity of H_2SO_4 using standard NaOH (A) phenolphthalein (B) bromophenol blue (C) methyl orange (D) starch (E) none of the above
18. Which of the following is the strongest acid among the series formed by chlorine (A) $HClO_4$ (B) $HClO_2$ (C) $HClO_3$ (D) HClO (E) None of the above
19. Which of the following can be Lewis acid (A) CH_4 (B) BF_3 (C) CH_3^- (D) Cl_2 (E) None of the above
20. Which of the following acids is the most acidic? (A) 0.10 M H_3PO_4: pH = 1.4 (B) 0.10 M $H_2PO_4^-$: pH = 4.4 (C) 0.10 M HPO_4^{2-}; pH = 9.3 (D) 0.10 M PO_4^{3-}: pH = 12.0 (E) None of the above
21. Which of the following is identification of oxygen gas? (A) Damp blue litmus paper turns red then white (B) rekindles a glowing sping (C) lighted splint pops (D) none of the above (E) all of the above
22. Which of the following is an acidic oxide (A) CaO (B) RbO_2 (C) SeO_3 (D) Na_2O_3 (E) all of the above
23. Which of the following is not a redox reaction? (A) $2Cr_2O_4^{2-} + 2H^+ \rightarrow + Cr_2O_7^- + H_2O$ (B) $Cr_2O_4^{2-} + 6Fe^{2+}$ 14 $H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$ (C) $2IO^{3-} + 12H^+ + 10I^- \rightarrow 6I_2 + 6H_2O$ (D) $2MnO_4^- + 5NO_2^- + 6H^+ \rightarrow Mn^{2+} + 5NO_3^- + 3H_2O$ (E) none of the above
24. Which of the following is not a way by which a solid solute can be made to dissolve more quickly in a liquid solvent? (A) by stirring vigorously by heating and shaking (C) by grinding to powder (D) by pulverizing (E) None of the above
25. Which of the following is the strongest Bronsted acid? (A) H_3O^+ (B) HF (C) NH_3 (D) $NaHSO_4$ (E) NaOH
26. Which of the following is the strongest Bronsted base? (A) H_2O (B) SH (C) OH^- (D) S^{2-} (E) O^{2-}
27. Which of the following is the weakest Bronsted acid? (A) $HClO_4$ (B) H_3PO_4 (C) H_2CO_3 (D) H_2SO_4 (E) $Al(OH)_3$
28. Which of the following is are correct laboratory practice(s)? (A) avoid use of naked flame when handling in flammable liquids (B) avoid holding necks of bottles containing hazardous materials (C) avoids throwing solid waste in the sink (D) all of the above (E) none of the above
29. 29 Which of the following solution is the strongest oxidising agent? (A) MnO_4^- in acid (B) MnO_4^- in base (C) MnO_2 in base (D) $Cr_2O_7^{2-}$ in acid (E) $Cr_2O_7^{2-}$ in base
30. Balance the reaction in basic medium? $MnO_4^- + I^- \rightarrow MnO_2 + I_2$ (A) $2MnO_4^- + 6I^- + 4H_2O \rightarrow MnO_2 + I_2 + 3S + 7H_2O$ (B) $MnO_4^- + 2I^- + 4H_2O \rightarrow MnO_2 + I_2 + O_2$ (C) $2MnO_4^- + 6I^- + 6H^+ \rightarrow MnO_2 + I_2 + O_2 + 3H_2O$ (D) $MnO_4^- + 2I^- + H_2O + 8H^+ \rightarrow MnO_2 + I_2 + O_2 + 3H_2O$ (E) none of the above
31. $3ClO^- \rightarrow ClO_3^- + 2Cl^-$ is an example of? (A) reduction reaction (B) oxidation reaction (C) disproportional reaction (D) decomposition reaction (E) none of the above
32. A solution is prepared by mixing 1.00 of ethanol C_2H_5OH, with 100.0 g of water. Calculate the mass percent of ethanol in this solution? (A) 1.01% (B) 0.99% (C) 0.97% (D) 1% (E) 1.15%
33. A standard sodium hydroxide solution cannot be made by weighing accurately a given mass of the solid and making it up to the required volume of solution because it is_____ (A) effervescent (B) hygroscopic (C) deliquescent (D) a dessicant (E) None of the above
34. A standard solution is_____? (A) a solution that is standardized in the laboratory (B) a solution that is titrated by using an acid and a base (C) a solution that is made by dissolving the solute in a solvent (D) a solution whose concentration is accurately known (E) none of the above
35. A stock solution of potassium dichromate $K_2Cr_2O_7$ was made by dissolving 89.3 g of the compound in 1.10% of solution. How many ml. of this solution is required to prepare 1.00 L of 0.100M $K_2Cr_2O_7$? (A) 110 ml. (B) 165 mL (C) 274 mL (D) 494 mL (E) none of the above
36. A student was given a sample of hydrochloric acid and asked to find the concentration in mol/dm³. She titrated 25 cm³ of the acid against a standard solution of sodium hydroxide of 0.1 mol/dm³ the average titre of sodium hydroxide was 30cm³. What is the concentration of the acid? (A) 0.5 mol/dm³ (B) 0.12 mol/dm³ (C) 1.25 mol/dm³ (D) 1.0 mol/dm³ (E) none of the above
37. All the listed are necessary precautions to be observed in the laboratory except. (A) avoid skin contact with chemicals (B) keep workspace clean (C) wear laboratory coat (D) cat in the laboratory (E) none of the above
38. All the listed compounds are strong acids except? (A)H_2SO_4 (B) HCI (C) HNO_3 (D) H_2CO_3 (E) none of the above
39. All the properties listed are required of a primary standard except (A) highly pure (B) possess definite composition (C) stable at room temperature (D) hygroscopic (E) none of the above
40. Balance the reaction in acidic medium? $Cr_2O_4^{2-} + 2H_2S \rightarrow Cr^{3+} + S$ (A) $3H_2S + 8H^+ + Cr_2O_7^{2-} \rightarrow 2Cr^{3+} + 3S + 7H_2O$ (B) $Cr_2O_7^{2-} + H_2S \rightarrow 2Cr^{3+} + 2H^+ + S$ (C) $Cr_2O_7^{2-} + 14H^+ + H_2S \rightarrow 2Cr^{3+} + 2H^+ + S + 7H_2O$ (D) $Cr_2O_7^{2-} + H_2S + 5e^- \rightarrow Cr^{3+} + S$ (E) none of the above

END OF PAPER

CHM107 Solutions 2023/2024 session

1. The balanced equation is: $CaCO_3 \rightarrow CaO + CO_2$.
The molar mass of $CaCO_3$ is 100 g/mol, and the molar mass of CaO is 56 g/mol.
Moles of $CaCO_3$ =mass/molar mass = 60/100=0.6 mol
From the stoichiometry of the balanced equation,
1 mole of $CaCO_3$ produces 1 mole of CaO.
∴ 0.6 mol of $CaCO_3$ will produce 0.6 mol of CaO.
Mass of CaO =moles×molar mass=0.6× 56= 33.6 g
Answer: (D)

2. Assume 100g of solution. This contains 37.7 g of HCl.
Moles of HCl = mass / molar mass
Moles = 37.7 / (1.0 + 35.5) = 1.03 mol
Volume of solution = mass / density
V = 100/1.195 g/mL = 83.7 mL = 0.0837 L
Molarity = moles / volume = 1.03/ 0.0837 = 12.3 M
Answer: (B)

3. Molar mass of KCl = 39 + 35.5 = 74.5 g/mol
Moles of KCl needed for 0.02M soln in 1L = 0.02 mol
Mass of KCl =moles×molar mass =0.02×74.5 = 1.49g
Answer:(A)

4. Molar mass of $Na_2Cr_2O_7$ = 2(23)+2(52)+7(16) = 294
Moles of $Na_2Cr_2O_7$ needed for 0.025 M solution in 100 mL (0.1 L) = 0.025 mol/L × 0.1 L = 0.0025 mol
Mass of $Na_2Cr_2O_7$ needed = moles×molar mass
M = 0.0025 mol × 294 g/mol = 0.735g
Answer: Approximately 0.74 g

5. Molar mass of $NaHCO_3$ = 23 + 1 + 12 + 3(16) = 84
Moles of $NaHCO_3$ = 8.20 g / 84 g/mol = 0.0976 mol
From the stoichiometry,
1 mol H_2SO_4 reacts with 2 mol $NaHCO_3$.
∴moles of H_2SO_4 needed = 0.0976/ 2 = 0.0488 mol
Volume of H_2SO_4 = moles / molarity
V = 0.0488 mol / 0.150 mol/L = 0.325 L = 325 mL
Answer: (B)

6. Let's assume we need to prepare 100 mL of a 0.12 M HNO_3 solution. First, calculate the moles of HNO_3 needed:
Moles of HNO_3 = Molarity × Volume (in Liters)
Moles = 0.12 mol/L × 0.100 L = 0.012 mol
Now, use the molarity of the stock solution to find the volume needed:
Volume of stock solution = Moles of HNO_3 / Molarity of stock solution = 0.012/ 15.8 = 0.000759 L
Converting liters to milliliters:
Volume of stock solution = 0.000759L ≈ 0.76 mL
Answer: (A)

7. Combustion of natural gas (primarily methane, CH_4) produces carbon dioxide (CO_2) and water (H_2O). CO_2 dissolves in water to form carbonic acid (H_2CO_3), a weak acid.
The presence of carbonic acid in rainwater will lower the pH, making it more acidic.
Therefore, the pH of the rainwater in the Niger Delta environment would likely be less than 7 (neutral)
Answer: (C)

8. Phenolphthalein is a pH indicator that changes color in the slightly basic range (pH of 8.2–10.0). It is colorless in acidic solutions and pink in basic solutions.
Suitable reactions for phenolphthalein are strong acid-strong base titrations. Options (A) and (D) involve strong acids (HCl and H_2SO_4) and strong bases (NaOH and KOH), resulting in a sharp pH change around the equivalence point that falls within the phenolphthalein range
Options (B) and (C) involve weak acids (CH_3COOH) and a weak base (NH_3), resulting in a less sharp pH change, making phenolphthalein less suitable.
Answer: (A)

9. A primary standard is a highly purified compound used to prepare a standard solution of known concentration. It should be:
   - Highly pure
   - Stable in air
   - Readily available
   - Have a high molar mass to minimize weighing errors
   - Readily soluble in the solvent used

NaOH is hygroscopic (absorbs moisture from the air), making it difficult to obtain a precise mass, hence not suitable. **Answer: (A)**

10. Calculating the molar mass of NaOH: 23+1+16= 40
Calculating the number of moles of NaOH:
Moles = 16/40 g/mol = 0.4 mol
Converting the volume to dm^3: 200 cm^3 = 0.2 dm^3
Calculating the concentration: 0.4/0.2 = 2.0 $moldm^{-3}$
Answer: (A)

11. Calculating the molar mass of NaOH: 23 + 1+16 = 40
Calculating the No of moles of NaOH: 0.4/40= 0.01
Convert the volume to liters: 250 mL = 0.25 L
Calculate the concentration: 0.01/ 0.25= 0.04 mol/L
Answer: (B)

12. pH is defined as $-\log_{10}[H^+]$. Therefore, $[H^+] = 10^{-pH}$
Calculating the $[H^+] = 10^{-5.3} \approx 5.0 \times 10^{-6}$ mol/L
Answer: (A)

13. Hydrochloric acid (HCl) is a strong acid, and ammonia (NH_3) is a weak base.
When equal amounts of a strong acid and a weak base react, the resulting solution will be slightly acidic.
The pH will be less than 7 but not significantly lower because the weak base will partially neutralize the strong acid. **Answer: (A)**

14. Calculating the molar mass of Na_2CO_3:
Mm = (2×23) + 12 + (3×16) = 106 g/mol
Calculating the number of moles of Na_2CO_3:
Moles =10.6 g / 106 g/mol = 0.1 mol
The solution is prepared by dissolving 0.1 mol of Na_2CO_3 in 1 liter of water. Therefore, the molar concentration is 0.1 mol/L
Answer: (C)

15. Calculating the moles of Na_2CO_3:
Moles = Molarity × Volume (L) =
Moles = 0.150× (44.8 mL × (1L/1000mL)) = 0.00672
Use the stoichiometry of the balanced equation to find the moles of HNO_3: From the balanced equation,
2 moles of HNO_3 react with 1 mole of Na_2CO_3.
∴ moles of HNO_3 = 2×0.00672 mol = 0.01344 mol
Calculating the volume of HNO_3:
Volume = Moles/Molarity=0.01344/0.250= 0.05376L
Converting the volume to mL: 53.76 mL ≈ 53.80 mL
Answer: (C)

16. Calculate the moles of Na_2CO_3 needed:
Moles = Molarity×Volume (in Liters)
Moles= 0.05×(250 mL×(1L/1000 mL)) = 0.0125 mol
Calculating the mass of Na_2CO_3: = 106.0 g/mol
Mass = Moles × Molar mass = 0.0125×106.0=1.325g
Answer: (D)

17. The titration of H_2SO_4 with NaOH is a strong acid-strong base titration. Phenolphthalein is suitable for strong acid-strong base titrations because its color change occurs near the equivalence point (pH 7-8)
Answer: (A)

18. The strength of oxyacids increases with the number of oxygen atoms. $HClO_4$ has the most oxygen atoms and is therefore the strongest acid in the series.
Answer: (A)

19. A Lewis acid is an electron-pair acceptor. BF_3 has an incomplete octet and can accept an electron pair, making it a Lewis acid.
Answer: (B)

20. The lower the pH, the more acidic the solution. 0.10 M H_3PO_4 with a pH of 1.4 is the most acidic among the given options.
[11/ Answer: (A)

21. Analyze each option for oxygen gas identification.
(A) Damp blue litmus paper turns red then white: This describes the reaction of an acidic gas like sulfur dioxide, not oxygen.
(B) Rekindles a glowing splint: This is a classic test for oxygen. Oxygen supports combustion.
(C) Lighted splint pops: This describes the reaction of hydrogen gas, not oxygen.
Only (B) accurately describes a test for oxygen gas.
Answer: (B)

22. Acidic oxides react with water to form acids. They are typically non-metal oxides.
    - CaO: Calcium oxide is a basic oxide.
    - RbO_2: Rubidium oxide is a basic oxide.
    - SeO_3: Selenium trioxide is an acidic oxide.
    - Na_2O_3: Sodium oxide is a basic oxide.

Answer: (C)

23. Redox reactions involve a change in oxidation states. One substance is oxidized (loses electrons), and another is reduced (gains electrons)
    - Cr changes oxidation state.
    - Cr and Fe change oxidation states.
    - I changes oxidation state.
    - Mn and N change oxidation states.

Option (A) shows a change in the oxidation state of chromium, but it's a disproportionation reaction, not a redox reaction in the sense of two different species changing oxidation states. However, all the other options clearly show redox reactions.
Answer: (A)

24. Increasing the surface area (grinding, pulverizing), stirring, heating, and shaking all increase the rate of dissolution. All options listed are ways to increase the rate of dissolution. **Answer: (E)**

25. Brønsted acids are proton (H^+) donors.
H_3O^+, HF, and $NaHSO_4$ are all Brønsted acids.
NH_3 is a Brønsted base, and NaOH is a Brønsted base.
Among the acids, H_3O^+ is the strongest.
Answer: (A)

26. Brønsted bases are proton (H^+) acceptors.
H_2O, SH^-, OH^-, S^{2-}, and O^{2-} are all Brønsted bases.
O^{2-} is the strongest because it has the greatest capacity to accept protons.
Answer: (E)

27. $HClO_4$, H_3PO_4, H_2CO_3, and H_2SO_4 are all Brønsted acids. $Al(OH)_3$ is amphoteric, but acts as a weak acid. Among these, $Al(OH)_3$ is the weakest acid.
Answer: (E)

28. Analyzing each statement.
    - Avoiding naked flames with flammable liquids is a crucial safety precaution.
    - Holding bottles of hazardous materials by the neck can lead to spills and exposure.
    - Throwing solid waste in the sink can clog drains and contaminate wastewater.
    - Determine the correctness of each statement.
    - All three statements (A, B, and C) represent correct laboratory practices.

Answer: (D)

29. Consider the oxidizing agents. Strong oxidizing agents readily accept electrons.
Analyzing each option.
The strength of an oxidizing agent depends on its oxidation state and the conditions (acidic or basic). In general, higher oxidation states favor stronger oxidizing agents.
MnO_4^- in acid is a very strong oxidizing agent.
MnO_4^- in base is also a strong oxidizing agent, but generally weaker than in acid. The other options are weaker oxidizing agents compared to permanganate.
Answer: (A)

30. Writing the unbalanced equation:
$MnO_4^- + I^- \rightarrow MnO_2 + I_2$
Balance the Mn atoms: $2MnO_4^- + I^- \rightarrow 2MnO_2 + I_2$
Balance the I atoms: $2MnO_4^- + 2I^- \rightarrow 2MnO_2 + I_2$
Balance the oxygen atoms by adding H_2O:
$2MnO_4^- + 2I^- \rightarrow 2MnO_2 + I_2 + 4H_2O$
Balance the hydrogen atoms by adding OH^-:
$2MnO_4^- + 2I^- + 4H_2O \rightarrow 2MnO_2 + I_2 + 8OH^-$
Verify the charge balance:
Both sides have a -2 charge. **Answer: (E)**

31. A Disproportionation is a redox reaction where the same element is both oxidized and reduced.
Analyzing this reaction: $3ClO^- \rightarrow 2Cl^- + ClO_3^-$
Identify the changes in oxidation states.
Chlorine in ClO^- has an oxidation state of +1.
In Cl^- it's -1, and in ClO_3^- it's +5.Some Cl atoms are reduced (+1to-1), while others are oxidized (+1to+5)
Answer: (C)

32. Calculating the total mass of the solution:
1.00 g ethanol + 100.0 g water = 101.0 g
Calculating the mass percent of ethanol:
(mass of ethanol / total mass of solution) × 100%
%Mass= (1.00/ 101.0) × 100% ≈ 0.99%
Answer: (B)

33. Consider the properties of sodium hydroxide (NaOH). NaOH is hygroscopic, meaning it readily absorbs moisture from the air. This absorption of moisture makes it difficult to accurately weigh out a specific mass of NaOH, as the mass will constantly change due to water absorption. **Answer: (B)**

34. Analyzing each option
(A) A standard solution is not solely defined by being standardized in a laboratory; the process of standardization determines its concentration.
(B) Titration is a method used to determine the concentration of a solution, but it doesn't define what a standard solution is.
(C) Dissolving a solute in a solvent creates a solution, but doesn't guarantee its concentration is accurately known.
(D) A standard solution is, by definition, one whose concentration is accurately known. **Answer: (D)**

35. Calculating the molar mass of $K_2Cr_2O_7$.
$(39.10)\times2 + (51.996)\times2 + (16.00)\times7 = 294.18$ g/mol
Calculating the moles of $K_2Cr_2O_7$ in the stock solution
Moles = 89.3 g / 294.18 g/mol = 0.303 moles
The problem states the stock solution is 1.10% by mass. This means 1.10g of $K_2Cr_2O_7$ is present in 100 g of solution.
We need to find the total mass of the solution.
Let x be the total mass of the solution.
Then $0.011x = 89.3$g.
Solving for x, we get x = 8118.18 g.
Since the density of the solution is approximately 1 g/mL, the total volume of the stock solution is approximately 8118.18 mL.
Calculating the molarity of the stock solution
Molarity = moles/volume (in Liters)
M = 0.303/ (8118.18 mL × 1L/1000mL) = 0.0373 M
Using the dilution formula ($M_1V_1 = M_2V_2$) to find the volume of stock solution needed.
$(0.0373)(V_1) = (0.100)(1.00)$ $\therefore V_1 = 2.68L = 2680$ mL
Answer: (E)

36. $HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$
Using the titration data to find the moles of NaOH used: moles NaOH = (0.1) × ($0.03dm^3$) = 0.003 mol
From the stoichiometry of the balanced equation, the mole ratio of HCl to NaOH is 1:1.
Therefore, moles HCl = 0.003 mol
Calculating the concentration of HCl:
Conc. = moles/volume = $0.003/0.025dm^3$=0.12M
Answer: (B)

37. Answer: (D)
38. Answer: (D)
39. Answer: (D)
40. Answer: (A)