

# Chapter One : Safe Use of Laboratory

## Creative Essay Type

1. ► From the below table answer the following questions—

KMnO <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub>	Aqueous solution of the third member of alkaline metal
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[Adamjee Cantonment College, Dhaka]

- What is coagulation? 1
- Explain the reasons of stability of colloid. 2
- How can you prepare the semi molar 250 mL solution of alkaline compound explain. 3
- "The excessive use of the mentioned chemicals detrimentally effects on environment and human health"—explain. 4

Ans: See HSC EV Chemistry 1st Paper 1st Chapter Note Ques. No. 19 of Answer Paper.

2. ► To measure the mass of Na<sub>2</sub>CO<sub>3</sub> following weights are used 2g, 1g, 500mg, 100gm and 50mg. The rider is 10mg. The rider beam is divided into 0-50 divisions. The rider is balanced on the 14<sup>th</sup> division of the beam. The Na<sub>2</sub>CO<sub>3</sub> is dissolved in 500ml solution.

[The Millennium Stars School and College, Rangpur]

- What is zite gloves? 1
- How you will be cautious before the drainage of the chemicals? 2
- How will you prepare 100ml centimolar from the stem's solution? 3
- 25 ml HCl solution is titrated by 10ml newly prepare solution of (c). Find out the number of molecules of HCl. 4

Ans: See HSC EV Chemistry 1st Paper 1st Chapter Note Ques. No. 22 of Answer Paper.

3. ►

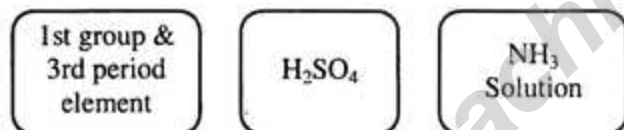


Fig : A

Fig : B

Fig : C

[Pabna Cadet College, Pabna]

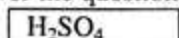
- What is molarity? 1
- Define with example primary standard substance? 2
- Is it possible to mix water with fig: A & Fig: B directly?—explain. 3
- Excess use of mentioned substance is harmful to health & environment—analyze. 4

Ans: See HSC EV Chemistry 1st Paper 1st Chapter Note Ques. No. 26 of Answer Paper.

4. ► Observe the stem and answer the questions:



Chemical "A"



Chemical "B"

[Faujdarhat Cadet College, Chattogram]

- What is spectrum? 1
- Explain Pauli's exclusion principle? 2
- Explain the safety preservation of chemical— "A". 3
- Explain the importance of minimum use of Chemical "B" to preserve environment. 4

Ans: See HSC EV Chemistry 1st Paper 1st Chapter Note Ques. No. 31 of Answer Paper.

► Question No. a (Knowledge based)

Ques-1. What is a standard solution? [D.B.-17]

Ans: At a fixed temperature if we know the amount of solute in a fixed amount of solvent of a solution, then that solution is called standard solution.

Ques-2. What is laboratory kit? [R.B.-16]

Ans: All necessary substances used in the first aid box are collectively called laboratory kit.

Ques-3. What is first aid box? [Dj.B.-17]

Ans: The box containing necessary equipments for the primary treatment of small accidents in the laboratory is called first aid box.

Ques-4. What is semi-micro analysis? [Dj.B.-16]

Ans: When in an inorganic qualitative analysis the amount of sample is between 0.05 gm to 0.2gm and the amount of solution is 2-4 ml, it is known as semi-micro analysis.

Ques-5. What is molarity? [C.B.-16]

Ans: At fixed temperature the amount of solute in molecular mass or mole dissolved in one liter of solvent is called the molarity of that solute in that solvent.

Ques-6. What is rider constant? [S.B.-17]

Ans: If we place rider on beam then for each marking of the beam, the weight obtained is called raider's constant.

► Question No. b (Comprehension based)

Ques-1. Explain the importance of optimum use of chemicals in the laboratory. [D.B.-17]

Ans: To conduct different types of test in the lab, we use different chemicals. In addition to different acid, base and salts there are different toxic and harmful chemicals. Excessive use of these chemicals will pollute air, water and soil. As a result environment and human health are under extreme danger. So the chemicals should be used optimally in the lab.

Ques-2. Why ammonia is used in glass cleaner? [R.B.-16]

Ans: NH<sub>3</sub> is used as the main ingredient in glass cleaner. Because NH<sub>3</sub> reacts with water to form NH<sub>4</sub>OH. The OH<sup>-</sup> ion of NH<sub>4</sub>OH do not cause any harm to the glass. It removes the dirt on glass by reacting with the metal oxides that remains as dirt on glass and is removed from the surface of the glass. For this reason NH<sub>3</sub> is used as glass cleaner.

Ques-3. Give the precautionary measures for cleaning the glass ware. [Ctg.B.-17]

Ans: The following precaution should be taken during cleaning of glass apparatus :

- The apparatus should not hit the water tap or basin.
- Care should be taken so that the apparatus is not broken due to excessive pressure during connecting with stand by clamp.
- We should not heat glass apparatus when there is water on the outside.

- iv. The heated glass apparatus can never be washed with water. In this case the hot glass will break down if comes in contact with water.

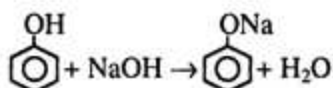
**Ques-4. Explain the necessity of use of safety glass in laboratory.**

**Ans:** Necessity of use of safety glass in laboratory is explained below—

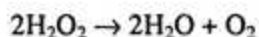
- During the heating of chemicals in a burner bumping of liquids can harm the face and eyes. Safety glass can protect from such accidents.
- Prescription glasses do not guarantee adequate protection, so prescription safety glass may be needed. Organic reagents exposed to solvent vapour or splashes can be significantly damaged. Safety glasses are specially made for these purposes.

**Ques-5. How you will be cautious before the drainage of the chemicals?**

**Ans:** Before draining a chemical substance, after using it should be neutralized with proper process. But this neutralization should be done using fume hood. We have to use acid to neutralize base and vice-versa. For example— Phenol is a weak acid. So NaOH can be used to neutralize it. The reaction is :



Again,  $\text{H}_2\text{O}_2$  before draining should be neutralized using acid or base or can be dissociated in the following way in presence of catalyst:



**Ques-6. Express the strength of 6% (w/v) NaOH in Molar concentration.**

**Ans:** 6% NaOH solution means

In 100 mL solution there is 6g NaOH

$$\begin{aligned} \text{In } 1000 \text{ mL " " " " } &= \frac{6 \times 1000}{100} \text{ g NaOH} \\ &= 60 \text{ g/L} \end{aligned}$$

$$\begin{aligned} \text{Molar concentration of NaOH solution} &= \frac{60}{40} \text{ mol L}^{-1} \\ &= 1.5 \text{ M} \end{aligned}$$

Therefore, Molar concentration of given NaOH solution = 1.5M

### Creative Multiple Choice

- Why should 4%  $\text{Na}_2\text{CO}_3$  be used due to acid spilling on eyes while working in the laboratory?
  - to neutralise acidic action

- $\text{NaHCO}_3$  reacts with water
- to reduce the pH of tears
- to make the eyes insensible

2. What is the difference in mL of two successive divisions in a burette? [D.B.-17]

- 1.0
- 0.1
- 0.01
- 0.001

3. Which glassware should be used to measure 250 mL and 3500 mL distilled water for adding to solutions kept in two round bottomed flasks?

- pipette
- burette
- measuring cylinder
- beaker

4. Which hazard symbol is used to store LPG and CNG? [D.B.-16]



5. Which one is a primary standard substance? [D.B.-16]

- $\text{KMnO}_4$
- $\text{H}_2\text{SO}_4$
- $\text{Na}_2\text{S}_2\text{O}_3$
- $\text{K}_2\text{Cr}_2\text{O}_7$

6. Which solution is used in case of acid-spillage on the part of a body? [Ctg.B.-17]

- 5%  $\text{Na}_2\text{CO}_3$
- 5% KOH
- 5% NaOH
- 5%  $\text{NaHCO}_3$

7. What should be used to remove grease or oily substance inside a burette?

- $\text{K}_2\text{Cr}_2\text{O}_7$  and conc.  $\text{H}_2\text{SO}_4$
- conc.  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{H}_2\text{SO}_4$
- $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{H}_2\text{SO}_4$
- conc.  $\text{K}_2\text{Cr}_2\text{O}_7$  and conc.  $\text{H}_2\text{SO}_4$

8. Which of the following is used to keep the chemical substance dried? [Dj.B.-16]

- dessicator
- calorimeter
- bunsen burner
- fume hood

9. What type of precautionary measure is to be taken while working with acids, alkalis and different types of toxic substances, like As, Ag, Pb etc.?

- to wear apron
- to use goggles
- to use mask
- to use gloves

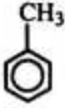

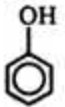

10. Which one is better used to measure 10.5mL of  $\text{kmnO}_4$  accurately? [Ctg.B.-17]

- volumetric flask
- burette
- conical flask
- pipette

11.  $\text{Anhydrous AlCl}_3 + 3 \text{H}_2\text{O} \rightarrow \text{Al(OH)}_3 + \text{B}$ .

Which of the following is suitable to use in order to protect from the product B of the given reaction?

- Safety glass
- Hand gloves
- Mask
- Chemical splash goggles

12. Which one of the following is used in case of alkali contamination of eyes?  
 (a) 4% CH<sub>3</sub>COOH (b) 5% CH<sub>3</sub>COOH  
 (c) 4% NaHCO<sub>3</sub> (d) H<sub>3</sub>BO<sub>3</sub> (d)
13. What is the minimum amount of substance that can be weighed on a Paul Bunge balance?  
 (a) 0.0001g (b) 0.0002g  
 (c) 0.0010g (d) 0.0020g (d)
14. Which one is used instead of H<sub>2</sub>S in a laboratory?  
 [S.B.-16]  
 (a) CH<sub>3</sub>COOH (b) CH<sub>3</sub>CSNH<sub>2</sub>  
 (c) CH<sub>3</sub>CONH<sub>2</sub> (d) CH<sub>3</sub>CH<sub>2</sub>NH<sub>2</sub> (b)
15. Why is distilled water used to clean instrument in the laboratory?  
 (a) This water does not contain any minerals and micro organisms.  
 (b) This water contains a lot of minerals.  
 (c) Instruments are easily cleaned with this water.  
 (d) This water is easily available (d)
16. Which of the following is a measurement of A-digit balance? [B.B.-17]  
 (a) 1.024 (b) 10.24  
 (c) 22.1202 (d) 2212.02 (c)
17. Which one is chromic acid?  
 (a) Conc. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and H<sub>2</sub>SO<sub>4</sub> Solution  
 (b) Solution of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and conc. H<sub>2</sub>SO<sub>4</sub>  
 (c) Solution of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and dil. H<sub>2</sub>SO<sub>4</sub>  
 (d) Solution of Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and conc. H<sub>2</sub>SO<sub>4</sub> (b)
18. Which of the following is used to clean burette?  
 [Dj.B.-15]  
 (a) Chromic acid (b) Soap  
 (c) Detergent (d) Sodium bicarbonate (d)
19. Which one is used to measure the volume of a solution accurately? [All Board-18]  
 (a) Pipette and measuring cylinder  
 (b) Burette and pipette  
 (c) Burette and graduated beaker  
 (d) Graduated beaker and measuring cylinder (b)
20. Which aqueous solution is used to destroy LiAlH<sub>4</sub> waste? [S.B.-15]  
 (a) Na<sub>2</sub>CO<sub>3</sub> (b) NaHSO<sub>4</sub>  
 (c) Na<sub>2</sub>SO<sub>4</sub> (d) NaHCO<sub>3</sub> (c)
21. Which of the following acids is the strongest? [All Board-18]  
 (a) H<sub>2</sub>SO<sub>4</sub> (b) HClO<sub>4</sub>  
 (c) H<sub>3</sub>PO<sub>4</sub> (d) HNO<sub>3</sub> (b)
22. Which one is used instead of reagent benzene?  
 (a)  (b)   
 (c)  (d) C<sub>2</sub>H<sub>5</sub>OH (d)
23. Which process is carried out in Liebig condenser?  
 (a) Condensation (b) Evaporation  
 (c) Crystallisation (d) Distillation (a)
24. Why is porcelain used in wire gauze?  
 (a) For rapid heating  
 (b) For uniform heat conduction  
 (c) For higher heat conduction  
 (d) For rapid cooling (b)
25. Which one is toxic?  
 (a) Toluene (b) Calcium chloride  
 (c) Potassium carbonate (d) Carbon tetrachloride (d)
26. What amount of substance is required for a single test in semi-micro analysis?  
 (a) 1.5 g (b) 1.0 g  
 (c) 0.5 g (d) 0.1g (d)
27. Which one is the full representation of MSDS?  
 (a) Material Safety and Data Sheets  
 (b) Matter soundness and Direction Sheet  
 (c) Metal Solid Dilute Substance  
 (d) Method of Solid and Dry Substance (a)
28. What type of reaction occurs when glassware are cleaned with chromic acid?  
 (a) Reduction (b) Substitution  
 (c) Oxidation (d) Neutralisation (c)
29. Highest temperature applied to a porcelain basin is —  
 (a) 1000°C (b) 1200°C  
 (c) 1350°C (d) 1500°C (b)
30. H<sub>2</sub>SO<sub>4</sub> + 2Na → Na<sub>2</sub>SO<sub>4</sub> + [X] ↑: How is 'X' collected?  
 (a) Through downward displacement of water  
 (b) Dissolving in water  
 (c) Using gas absorber  
 (d) Through upward displacement of air (d)
31.   
 What does it mean by this sign of the stem? [All Board-18]  
 (a) Irritant (b) Corrosive  
 (c) Harmful (d) Electrical hazard (a)
32. Which one is used as drying agent? [All Board-18]  
 (a) N<sub>2</sub>O<sub>5</sub> (b) P<sub>2</sub>O<sub>5</sub>  
 (c) Cl<sub>2</sub>O<sub>5</sub> (d) V<sub>2</sub>O<sub>5</sub> (b)
33. A group of BUET students observed that tannery wastes were discharged directly into water. What steps they would advise to prevent pollution?  
 (a) recycling (b) to incinerate  
 (c) to neutralise chemically (d) to bury under ground (b)

34. What is the accuracy of volume measurement of a burette used in chemical laboratory? [R.B.-16]

- (a) 0.05 mL (b) 0.01 mL  
(c) 0.1 mL (d) 1.0 mL

35. Used for preparing cleaning mixture — [Dj.B.-17]

- i.  $K_2Cr_2O_7$  ii.  $H_2SO_4$   
iii.  $H_2O$

Which one is correct?

- (a) i & ii (b) ii & iii  
(c) i & iii (d) i, ii & iii

36. Environmental friendly method — [S.B.-17]

- i. Macro method  
ii. Semi-micro method  
iii. Micro method

Which one is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

37.  $NH_4Cl + KOH = KCl + H_2O + X$ ;

Working with 'x' in laboratory —

- i. Use of safety glass necessary  
ii. Inhalation of X gas can cause death  
iii. Should wear safety dress

Which one is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

38.  $Na_2CO_3$  — [S.B.-16]

- i. Primary standard substance  
ii. Its aqueous solution is acidic  
iii. Its aqueous solution is basic

Which one is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

39. Mask is used in the laboratory —

- i. to save eyes  
ii. for face safety  
iii. for nose safety

Which one is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

40. Entrance of formalin into the body — [Dj.B.-16]

- i. damages kidney  
ii. possibility of cancer  
iii. possibility of blindness

Which one is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

41. Acid spillage on skin — [R.B.-16]

- i. to be washed with water  
ii. to be washed with dilute sodium bicarbonate solution  
iii. burnol cream has to be used

Which of the following is correct?

- (a) i & ii (b) ii & iii  
(c) ii & iii (d) i, ii & iii

42.  $R-OH + HCl \xrightarrow{ZnCl_2} X + H_2O$ ; X compound is —

- i. volatile  
ii. liquid at room temperature  
iii. harmful to body

Which of the following is correct?

- (a) i & ii (b) ii & iii  
(c) ii & iii (d) i, ii & iii

43. Used in titration —

- i. measuring cylinder  
ii. pipet  
iii. conical flask

Which of the following is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

44. Volumetric flask is used for —

- i. heating solution  
ii. to prepare standard solution  
iii. in volumetric analysis

Which of the following is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

45. Safety measure in using bunsen burner —

- i. to observe the hose pipe and gas line carefully  
ii. match should not be used for firing burner  
iii. air hole of the burner should always be kept closed

Which of the following is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

46. Heating by a bunsen burner —

- i. on oxidising flame ii. on reducing flame  
iii. continuously

Which of the following is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

47. Corrosive chemical substances —

- i. are to be stored in non-corrosive container  
ii. are to be stored in stainless steel container  
iii. are to be marked off by hazard symbol

Which of the following is correct?

- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii

48. Used to clean glassware in the Laboratory — [All Board-18]

- i.  $H_2SO_4$  ii.  $K_2Cr_2O_7$   
iii.  $CHCl_3$

Which of the following is correct?

- (a) i & ii (b) ii & iii  
(c) i & iii (d) i, ii & iii

49. Presently,  $H_2S$  gas is not used in precipitation scheme in semi-micro and micro analysis. Because –

- $H_2S$  gas is toxic and odorous
- it is expensive to prepare  $H_2S$  gas
- the scheme is time consuming

Which of the following is correct?

- (a) i & ii                      (b) i & iii  
(c) ii & iii                     (d) i, ii & iii

50. Acid spilling on skin — [R.B.-16]

- to be washed with water
- to be washed with dilute  $NaHCO_3$  solution
- burnol cream is to be used

Which of the following is correct?

- (a) i & ii                      (b) ii & iii  
(c) i & iii                     (d) i, ii & iii

Read the following stem and answer question numbers 51 and 52.

Misha filled the burette with  $H_2SO_4$  solution to conduct an acid-base titration. He started the titration by taking 10 mL  $NaOH$  in a round-bottomed flask.

51. What glassware Misha should use to transfer the substance into round bottomed flask?

- (a) conical flask              (b) measuring cylinder  
(c) wash bottle                (d) pipette

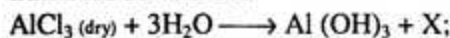
52. In the above mentioned titration —

- Burette has to be washed with distilled water gently
- Conical flask can be used instead of round-bottomed flask
- Used chemicals are harmful to skin

Which of the following is correct?

- (a) i & ii                      (b) i & iii  
(c) ii & iii                     (d) i, ii & iii

Observe the following equation and answer question numbers 53 and 54.



Sadia has prepared the gas 'X' by adding water dropwise to  $AlCl_3$  in the laboratory which is used neutralisation reaction.

53. Which is the nature of gas X?

- (a) acid                        (b) alkali  
(c) salt                         (d) water vapour

54. The X gas —

- is toxic
- can cause respiratory problem
- can damage the eyes

Which of the following is correct?

- (a) i & ii                      (b) i & iii  
(c) ii & iii                     (d) i, ii & iii

Read the following stem and answer the questions 55 and 56.

Farhana used a digital balance to prepare 250 mL of  $NaOH$ . Measuring precision of digital balance was 1/100. The visible weight of  $NaOH$  was 12.6 g and the weighing bottle weighed 1.80 g.

55. What type of balance was used by Farhana to weigh  $NaOH$ ?

- (a) 2-2-digit                    (b) 3-3-digit  
(c) 1-1-digit                    (d) 4-4-digit

56. What was the real weight of  $NaOH$  measured by Farhana?

- (a) 10.83 g                      (b) 11.57 g  
(c) 9.79 g                        (d) 10 g

Read the following stem and answer the questions 57 and 58. X is a halogen derivative and can be used as an aesthetic agent.

57. Which is the molecular formula of X?

- (a)  $C_6H_6$                         (b)  $CHCl_3$   
(c)  $CCl_4$                          (d)  $CH_3CH_2Cl$

58. Which is the alternative to X?

- (a)  $C_6H_{14}$                       (b)  $C_6H_5CH_3$   
(c) Ca                              (d)  $K_2CO_3$

Read the following stem and answer to question numbers 59 and 60.

Anik, while working in the laboratory forgot to take safety measures for eyes. He was heating an acid-containing test tube and during heating the acid bumped into his eyes. Lab-incharge washed his eyes with 4% alkali solution, Y and later sent to the doctor.

59. Which solution is Y?

- (a)  $NaHCO_3$                     (b)  $Na_2CO_3$   
(c)  $NaOH$                         (d)  $NH_4OH$

60. If, instead of acid, an alkali would have bumped into Anik's eyes, what should have been used by lab-incharge?

- (a) Sulfuric acid                (b) Boric acid  
(c) Soap solution                (d) Vinegar solution

Read the following information, and answer to the question numbers 61 and 62.

Faizah was pipetting oxalic acid solution for titration. She swallowed some oxalic acid while pipetting. [C.B.-16]

61. What alternative could have been used by Faizah instead of pipetting by mouth?

- (a) dropper                      (b) measuring cylinder  
(c) burette                        (d) pipette filler

62. What should Faizah do after swallowing the solution?

- to drink sufficient amount of water
- to drink lemon or orange juice
- to drink  $MgCO_3$  or lime water

Which one is correct?

- (a) i & ii                        (b) ii & iii  
(c) i & iii                        (d) i, ii & iii