**2. Question Bank - Solutions**

**Solution Calculation Practice Questions (multiple choice)**

1. What volume of 10X TBE buffer should you use to make 1 L of 1X TBE buffer?
A) 1 mL

B) 10 mL

C) 100 mL

D) 1000 mL

Answer: C

2. Chloe set up a restriction digest reaction. She added 2 µL of phage DNA, water and 8X CutSmart buffer (the final concentration of CutSmart buffer was 1X). If the total reaction volume was 40 µL, how much CutSmart buffer should she add to the reaction?

A) 2 µL

B) 5 µL

C) 8 µL

D) 16 µL

Answer: B

3. You are doing a restriction digest experiment to digest the *E. coli* genome with SapI. In your digest, you will include 1 µL of DNA, 1 µL of SapI, and 1X Cutsmart buffer (using a 10X stock). The final volume of your restriction digest is 50 µL. How much water will you add to the digest (note: don’t forget to include the volume of CutSmart Buffer in your final volume).

A) 5 µL

B) 43 µL

C) 44 µL

D) 45 µL

E) 50 µL

Answer: B

4. Kevin is performing a Northern Blot experiment. In one step of the experiment, he must denature DNA using a 1X denaturing solution. His stock of denaturing solution is 15X. He would like to make 100 mL of 1X denaturing solution. How much 15X stock solution should he use?

A) 0.15 mL

B) 0.67 mL

C) 6.7 mL

D) 10 mL

E) 15 mL

F) 25 mL

G) 67 mL

Answer: C

5. Dylan would like to make a 75 mL 0.75% agarose gel. How much agar should he add to 75 mL of 1X TBE buffer?

A) 0.5 g

B) 0.56 g

C) 0.66 g

D) 0.75 g

E) 1 g

Answer: B

6. How would you prepare 1 L of 1X TAE buffer if the stock solution was 50X TAE?

A) 20 mL of TAE and 980 mL of dH20

B) 980 mL of TAE and 20 mL of dH20

C) 50 mL of TAE and 950 mL of dH20

D) 950 mL of TAE and 50 mL of dH20

Answer: A

7. How would you prepare 1 L of working 1X TAE buffer if the stock solution was 10X TAE?

A) 100 mL TAE and 900 mL dH20

B) 900 mL TAE and 100 mL dH20

C) 10 mL TAE and 990 mL dH20

D) 990 mL TAE and 10 mL dH20

Answer: A

8. Elizabeth needs to prepare 250 mL of 1X TBE buffer. The stock solution in the lab is 10X TBE. How many milliliters of stock TBE does Lizzie need to prepare the working solution?

A) 10 mL

B) 25 mL

C) 50 mL

D) 250 mL

Answer: B

9. Jacob needs to prepare 750 mL of 1X TBE buffer. The stock solution in the lab is 10X TBE. How many milliliters of stock TBE does Jacob needs to prepare the working solution?

A) 1 mL TBE

B) 10 mL TBE

C) 75 mL TBE

D) 750 mL TBE

Answer: C

10. How many grams of HCL is needed to prepare 500 mL of 1M HCL? The MW of HCL is 36.47 g/mol.

A) 18.24 g

B) 36.47 g

C) 0.3647 g

D) 182.35 g

Answer: A

11. How many grams of sulfuric acid (H2SO4) is needed to prepare 50 mL of 0.25M H2SO4 solution? The MW of H2SO4 is 98.08 g/mol.

A) 0.25 g

B) 1.2 g

C) 24.5 g

D) 12.5 g

Answer: B

12. How many grams of sodium hydroxide is needed to prepare 100 mL of 2 M NaOH? The MW of NaOH is 39.99 g/mol.

A) 4 g

B) 40 g

C) 80 g

D) 8 g

Answer: D

13. I prepared 300 mL of 1.5 M HCl solution. How many grams of HCl were used to prepare this solution? The MW of HCl is 36.47 g/mol.

A) 16.4 g

B) 36.5 g

C) 10.9 g

D) 54.7 g

Answer: A

14. I prepared 500 mL of 0.25 M H2SO4 solution. How many grams of H2SO4 is needed to prepare this solution? The MW of H2SO4 is 98.08 g/mol.

A) 12.3 g

B) 24.5 g

C) 125 g

D) 98 g

Answer: A

15. Eric needed to prepare 1.5 L of 0.25 M HCl for his experiment. How many grams of HCl does Eric need to prepare his solution? The MW of HCl is 36.47 g/mol.

A) 9.1 g of HCl

B) 54.7 g of HCl

C) 13.7 g of HCl

D) 5.4 g of HCl

Answer: C

16. Sam weighed out 49.99 g of sodium hydroxide (NaOH). The final volume of his solution is 750 mL. What is the molarity of Sam's working stock of NaOH? The MW of NaOH is 39.99 g/mol.

A) 1.3 M

B) 5.3 M

C) 0.8 M

D) 6 M

Answer: A

17. Jessie needs 250 mL of 1.5 M ammonium sulfate. He notices only 50 g of ammonium sulfate remains in the lab. Does Jessie have enough to prepare his working stock? The MW of (NH4)2SO4 is 132.14 g/mol.

A) Yes, he only needs 7.9 g

B) Yes, he only needs 33 g

C) Yes, he only needs 49.5 g

D) No, time to put in an order!

Answer: C

18. What is the percent concentration of a solution prepared with 25 g of NaCl and diluted to 250 mL with ddH2O?

A) 2.50%

B) 10%

C) 25%

D) 100%

Answer: B

19. How many grams of agarose would you need to prepare 500 mL of a 0.7% agarose solution in TAE buffer?

A) 0.7 g

B) 3.5 g

C) 0.14 g

D) 350 mg

Answer: B

20. What is the percent concentration of a solution prepared with 100 mg of glucose diluted to 25 mL with ddH2O?

A) 0.25%

B) 0.40%

C) 4%

D) 25%

Answer: B

21. A student needs to prepare 50 mL of 10% methanol for a protein blotting procedure called a Western Blot. Select the correct mixture of methanol and ddH20 to prepare the necessary solution.

A) 10 mL of methanol and 40 mL of ddH20

B) 5 mL of methanol and 50 mL of ddH20

C) 5 mL of methanol and 45 ml of ddH20

D) 10 mL of methanol and 50 mL of ddH20

Answer: C

22. How many grams of powdered milk buffer is needed to prepare 400 mL of 5% milk buffer in PBS-T diluent?

A) 5 grams

B) 20 grams

C) 80 grams

D) 2000 grams

Answer: B

23. I have added 25 mL of ethanol to 475 mL of ddH20. What is the percentage of ethanol in my final working stock solution?

A) 5% ethanol

B) 5.26% ethanol

C) 25% ethanol

D) 19% ethanol

Answer: A

24. How many milliliters of 0.5 M HCl is needed to prepare 250 mL of 0.1 M HCl solution?

A) 25 mL

B) 50 mL

C) 5 mL

D) 250 mL

Answer: B

25. Sam used 250 mL of 2 M H2SO4 to prepare 2 L of working reagent. What is the molarity of the working solution?

A) 0.25 M

B) 1.25 M

C) 2.5 M

D) 5 M

Answer: A

26. Jane needs to prepare 1 L of 0.5 M NaOH solution. She has 200 mL of 2 M NaOH stock solution. Does Jane have enough stock solution to prepare he working solution?

A) No, she needs 250 mL of stock solution.

B) No, she needs 400 mL of stock solution.

C) Yes, she needs 200 mL of stock solution.

D) Yes, she needs 50 mL of stock solution.

Answer: A

27. How many mL of 2 M H2SO4 is needed to prepare 500 mL of a 0.5 M solution?

A) 125 mL

B) 250 mL

C) 500 mL

D) 1000 mL

Answer: A

28. John added 10 mL of 0.5 M HBr solution to 90 mL of dH20. What is the molarity of John's working HBr solution?

A) 0.01 M

B) 0.05 M

C) 0.1 M

D) 0.5 M

Answer: B

29. Julie needs 300 mL of 0.25 M perchloric acid (HCl04) for her experiment. She notices the lab only has 200 mL of 0.5 M HCl04 remaining. Does Julie have enough stock to make her working solution?

A) Yes, she only needs 150 mL of stock reagent.

B) Yes, she only needs 200 mL of stock reagent.

C) No, she needs 250 mL of stock reagent.

D) No, she needs 300 mL of stock reagent.

Answer: A

30. How many mL of 1 M KOH is needed to prepare 750 mL of 0.5 M KOH?

A) 50 mL

B) 100 mL

C) 375 mL

D) 750 mL

Answer: C

**Solution Calculation Practice Questions (open ended)**

1) You want to prepare exactly 0.5 L (500 mL) of a 0.250 M Na2SO4 solution in water. How many grams do you need to measure out for the solution? [MW of Na2SO4 is 142 grams per mole]

(1) Number of moles of solute = M (mol/L) x volume (L)

(2) Number of moles of Na2SO4 = (0.250 mol Na2SO4/1 L) x 0.500 L

 = 0.125 mol Na2SO4

(3) Then the number of grams of solute is computed

(4) X g Na2SO4 = 0.125 mol Na2SO4 x 142 g Na2SO4/ 1 mol Na2SO4

 = 17.8 g Na2SO4



Calculate how much of each ingredient you would need to make the solution for the following 7 questions. Circle your answers. Be sure to include the correct units with your answer.

Molecular weights: SDS = 288.38 g/mol Tris (base) = 121.1 g/mol EDTA = 372.2 g/mol

Sodium acetate = 82.03 g/mol Tris maleate = 237.2 g/mol Magnesium sulfate heptahyrdate = 246.5 g/mol Sodium hydroxide = 40.00 g/mol (can calculate the MW for simple compounds)

1) 100 mL of 20% SDS

(1) Add 20 grams of SDS powder to a flask and fill to 100 mL

2) 10 mL of 0.1 M NaCl

(1) NaCl MW is 58.44 g/mol

(2) 58.44 g/mol x 0.1 M/1 = 5.84 g

(3) 5.84 g / 1000 mL would be 0.1 M (so multiply) 5.84 g / 100 mL x X g/ 10 mL (solve for X)

(4) 0.0584 g or 58.4 mg need to be added to a flask and brought up to 10 mL final volume

3) 40 mL alkaline lysis buffer (0.2 M sodium hydroxide; 1% SDS)

(1) Sodium hydroxide MW = 40 g/mol

(2) 40 g/mol x 0.2 M/1 = 8 g

(3) 8 g /1000 mL x 40 mL/1 = 0.32 g sodium hydroxide

(4) 1% SDS is 1 g/100 mL stock solution

(5) Add 1 mL of 1% SDS to a flask, add 0.32 g sodium hydroxide, bring volume up to 40 mL

4) 100 mL of leech saline (115 mM NaCl; 1.8 mM CaCl2; 4 mM KCl; 10 mM Tris maleate (pH 7.4))

(1) NaCl MW = 58.44 g/mol

(2) 58.44 g/mol x 0.115 mol/1 = 6.72 g NaCl

(3) 6.72 g NaCl/1000 mL = X/100 mL = 0.672 g NaCl (add to a flask)

(4) CaCl2 MW = 110.98 g/mol

(5) 110.98 g/mol x 0.0018 mol/1 = 0.199 g CaCl2

(6) 0.199 g CaCl2 / 1000 mL = X/100 mL = 0.0199 g CaCl2 (add to the flask)

(7) KCl MW = 74.55 g/mol

(8) 74.55 g/mol x 0.004 mol/1 = 0.2982 g KCl

(9) 0.2982 g KCl/1000 mL = X/100 mL = 0.02982 g KCl (add to the flask)

(10) TRIS maleate MW = 237.2 g/mol

(11) 237.2 g/mol x 0.01 mol/1 = 2.372 g TRIS maleate

(12) 2.372 g/1000 mL = X/100 mL = 0.2372 g TRIS maleate (add to the flask)

(13) Bring volume in flask to 100 mL

5) 500 mL peptone/yeast extract agar (0.5% peptone; 0.1% yeast extract; 1.5% agar)

(1) 0.5% peptone = 0.5 g/100 mL

(2) 0.5 g/100 mL x 500 mL/1 = 2.5 g peptone (add to a flask)

(3) 0.1% yeast extract = 0.1 g/100 mL

(4) 0.1 g/100 mL x 500 mL/1 = 0.5 g yeast extract (add to the flask)

(5) 1.5% agar = 1.5 g/100 mL

(6) 1.5 g/100 mL x 500 mL/1 = 7.5 g agar (add to the flask)

(7) Bring volume up to 500 mL

6) 250 mL TE buffer (10 mM Tris (base); 1 mM EDTA, pH 8.0)

(1) Tris (base) MW = 121.1 g/mol

(2) 121.1 g/mol x 0.01 mol/1 = 1.211 g TRIS (base)

(3) 1.211 g/1000 mL = X/250 mL = 0.303 g TRIS (base) (add to a flask)

(3) EDTA MW = 372.2 g/mol

(4) 372.2 g/mol x 0.001 mol/1 = 0.3722 g EDTA

(5) 0.3722 g/1000 mL = X/250 mL = 0.093 grams EDTA (add to the flask)

(6) Bring volume up to 250 mL

7) 100 mL of 70% ethyl alcohol made from 95% ethyl alcohol (both liquid)

(1) C1V1 = C2V2

(2) 95% x X = 70% x 100 mL = 73.68 mL

(3) Take 73.68 mL of 95% ethyl alcohol and add 26.32 mL ddH2O = 100 mL of 70% ethyl alcohol