Multiple Choice

2-1 Safe, Ethical Handling of Chemicals and Waste

1. Which of the following statements are TRUE?

I Organic solvents, concentrated acids, and concentrated ammonia should be handled in a fume hood.
II A respirator should be worn when handling organic solvents.
III All containers should be labeled to indicate what they contain.
IV Contact lenses are adequate to protect eyes from liquids and gases in the lab.

A) I and II
B) II and IV
C) I and III
D) III and IV
E) II and III

Answer: C
Easy

2. _____ is a set of principles intended to help sustain a habitable planet.

A) Environmental chemistry
B) Analytical chemistry
C) Biological chemistry
D) Atmospheric chemistry
E) Green chemistry

Answer: E
Easy

2-2 The Lab Notebook

3. The _____ fulfills the critical function of reporting what a researcher has done and what they observed, and allows another researcher to repeat their work.

A) lab report
B) lab notebook
C) MSDS
D) project report
E) technical note

Answer: B
Easy

4. Which of the following is NOT a good practice when keeping a laboratory notebook?

A) Use complete sentences when writing notes.
B) Write a balanced chemical equation for every reaction used.
C) Paste hard copies of important data into the notebook.
D) Record the names of computer files where programs and data are stored.
E) All of the above are good practices when keeping a laboratory notebook.

Answer: E
Easy

2-3 Analytical Balance

5. The mass of the empty receiving vessel used with an analytical balance is the:

A) linearity.
B) buoyancy.
C) readability.
D) tare.
E) tolerance.

Answer: D
Easy

6. _____ is the upward force exerted on an object in a gaseous or liquid fluid. The mass measured by an analytical balance in air is _____ its actual mass.

A) buoyancy; heavier than
B) buoyancy; lighter than
C) electromagnetic force; heavier than
D) electromagnetic force; lighter than
E) tare; equal to

Answer: B
Intermediate

7. Which of the responses below are sources of weighing error?

I Weighing a sample that is warmer than ambient temperature.
II Cooling a sample in a desiccator prior to weighing.
III Periodically calibrating the balance.
IV The temperature of the balance changing over time.

A) I and II
B) I and III
C) II and IV
D) II and III
E) I and IV

Answer: E
Intermediate

2-4 Burets

8. Which scenario below has the lowest relative uncertainty?

A) Delivering 35.50 mL of titrant with a 50 +/− 0.05 mL class A buret.
B) Delivering 15.40 mL of titrant with a 50 +/− 0.05 mL class A buret.
C) Delivering 18.50 mL of titrant with a 25 +/−0.03 mL class A buret.
D) Delivering 5.40 mL of titrant with a 25 +/−0.03 mL class A buret.
E) Delivering 97.30 mL of titrant with a 100 +/−0.10 mL class A buret.

Answer: E (0.10% relative uncertainty)
Hard

9. A student prepares a solution using a 1 L volumetric flask. When he finishes, the meniscus is above the calibration mark on the flask neck. The concentration of the solution is:

A) less than calculated.
B) greater than calculated.
C) unchanged.
D) irrelevant.
E) impossible to predict.

Answer: A
Intermediate

10. A student titrated extracted chloride from a soil sample with 0.1 M silver nitrate. During the titration he performed the following actions while operating the buret.

- Washed the buret with silver nitrate solution
- Drained titrant slowly
- Delivered a fraction of a drop near end point
- Read bottom of concave meniscus
- Avoided parallax
- Accounted for graduation thickness in readings

His instructor notes on the student's lab report that the student forgot to ___when operating his buret.

A) eliminate air bubbles
B) estimate reading the buret to 1/10 of a division
C) fill the buret to exactly 0.00 mL
D) eliminate air bubbles and fill the buret to exactly 0.00 mL.
E) eliminate air bubbles and estimate reading the buret to 1/10 of a division.

Answer: E
Hard

2-5 Volumetric Flasks

11. Which of the following is FALSE regarding volumetric flasks?

A) Volumetric flasks are calibrated to obtain a particular volume at 20^{o}C.
B) Volumetric flasks are calibrated to deliver their indicated volume.
C) To properly use a volumetric flask, dissolve reagent in less than final volume and then dilute to volume.
D) The volume of the flask changes with temperature because liquid and glass expand when heated.
E) To obtain the calibrated volume, the bottom of the meniscus is aligned to the center of the neck of flask.

Answer: B
Intermediate

12. Which of the statements below is(are) TRUE regarding collecting and storing samples for trace analysis?

I Trace ionic analytes stored in glass are lost by adsorption or contaminated by metals leaching from the glass surface.
II Plastic bottles are recommended to collect and store ionic analyte samples.
III Amber glass bottles are best for collecting and storing aqueous samples of organic materials.

A) I and II
B) II and III
C) I and III
D) I, II, and III
E) III

Answer: D
Intermediate

2-6 Pipets and Syringes

13. _____ are calibrated to deliver one fixed volume and are _____ than _____.

A) Measuring pipets; more accurate; transfer pipets
B) Transfer pipets; less accurate; measuring pipets
C) Measuring pipets; more precise; transfer pipets
D) Transfer pipets; more accurate; measuring pipets
E) None of these answers is correct.

Answer: D
Intermediate

14. On a lab quiz, a student listed the steps to properly use a pipet. Which step is incorrect?

A) Use a rubber bulb to twice pull up a volume of liquid past the calibration mark and discard the contents into a waste container.
B) Pull up a third volume past the calibration mark and quickly replace the bulb with the index finger.
C) Touch the tip of the pipet to the side of a beaker and use the index finger to drain the liquid until the meniscus reaches the center of the calibration mark.
D) Transfer the pipet to the receiving vessel, touch the tip of the pipet to the side of the vessel, and allow the pipet to drain by gravity.
E) Use the rubber bulb to blow any remaining liquid from the pipet.

Answer: E
Intermediate

2-7 Filtration

15. _____ is the liquid from which a substance precipitates or crystallizes.

A) Filtrate
B) Eluate
C) Effluent
D) Mother liquor
E) Slurry

Answer: D
Easy

16. _____ is used to convert a precipitate to a known, constant composition.

A) Ashless filter paper
B) A fritted-glass funnel
C) Ignition
D) A rubber policeman
E) A dessicator

Answer: C
Easy

2-8 Drying

17. Drying to constant mass is a common gravimetric analysis technique. Which of the statements describe the source of false weights?

I A warm crucible
II Touching the crucible with bare fingers
III Using a microwave oven to dry reagents and crucibles
IV Using a desiccator

A) I, II, and III
B) II, III, and IV
C) I and II
D) II and IV
E) III and IV

Answer: C
Intermediate

2-9 Calibration of Volumetric Glassware

18. A 0.1500 M HCl solution was prepared on a day when the temperature was 20°C. What is concentration of the solution when used the next day at 27°C? The density of water is 0.9982071 g/mL at 20°C and 0.9965162 g/mL at 27°C.

A) 0.1503 M
B) 0.1497 M
C) 0.1508 M
D) 6.653 M
E) 6.632 M

Answer: B
Intermediate

19. A researcher dispenses distilled deionized water from a 20-mL volumetric pipet into an empty 8.4376 g weighting bottle. If the total mass of water and weighting bottle is 28.5845 g, what is the volume of the water delivered by the 20-mL pipet? The density of water is 0.9967867 g/mL.

A) 20.21 mL
B) 20.08 mL
C) 28.68 mL
D) 19.94 mL
E) 19.90 mL

Answer: A
Intermediate

Calculated

2-5 Volumetric Flasks

20) Describe how to prepare a 20.00 µg/mL iron solution from a 1 000 mg/mL iron standard solution using 10-mL and 50-mL volumetric pipets and 500-mL and 1 000-mL volumetric flasks.

Answer: 10 mL 1 000 mg/mL iron solution diluted to 500 mL to give a 20 000 µg/mL iron solution. 10 mL of 20 000 µg/mL iron solution diluted to 1 000 mL to give a 200 µg/mL iron solution. 50 mL of the 200 µg/mL solution is diluted to 500 mL to give a 20 µg/mL solution.
Hard