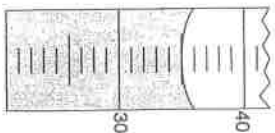


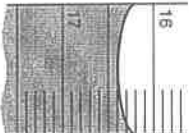
Name: **Significant Figures, Metric Conversions & Measurement and Percent Error**

1. The diagram below represents a portion of a 100-milliliter graduated cylinder.



- What is the reading of the meniscus?
- 1) 35.0 mL
 - 2) 36.0 mL
 - 3) 44.0 mL
 - 4) 45.0 mL

2. The diagram below shows a portion of a buret.

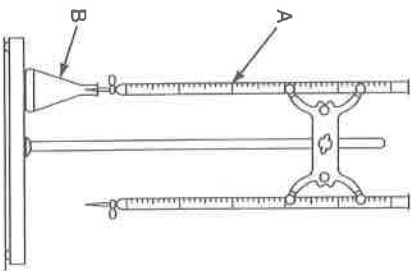


- What is the meniscus reading in milliliters?
- 1) 16.00
 - 2) 16.40
 - 3) 17.00
 - 4) 17.60

3. Which quantity of heat is equal to 200. joules?

- 1) 20.0 kJ
- 2) 2.00 kJ
- 3) 0.200 kJ
- 4) 0.0200 kJ

4. The diagram below shows a laboratory setup that can be used in a titration.



Which pieces of equipment are indicated by arrows A and B, respectively?

- 1) buret and Erlenmeyer flask
- 2) buret and volumetric flask
- 3) pipet and Erlenmeyer flask
- 4) pipet and volumetric flask

5. A temperature of 37°C is equivalent to a temperature of

- 1) 98.6 K
- 2) 236 K
- 3) 310. K
- 4) 371 K

6. Which kelvin temperature is equal to 56°C?

- 1) -329 K
- 2) -217 K
- 3) 217 K
- 4) 329 K

7. Which kelvin temperature is equivalent to -24°C?

- 1) 226 K
- 2) 249 K
- 3) 273 K
- 4) 297 K

8. A sample of water is being heated from 20°C to 30°C, and the temperature is recorded every 2 minutes. Which table would be most appropriate for recording the data?

1)

Time (min)	Temp (°C)
0	
2	
4	
6	
8	
10	

2)

Time (min)	Temp (°C)
20	
22	
24	
26	
28	
30	

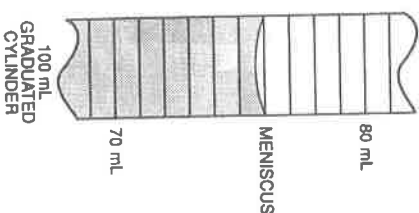
3)

Temp (°C)	Time (min)
0	
2	
4	
6	
8	
10	

4)

Temp (°C)	Time (min)
20	
22	
24	
26	
28	
30	

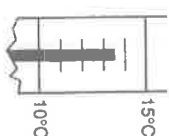
9. The diagram below shows a section of a 100-milliliter graduated cylinder.



When the meniscus is read to the correct number of significant figures, the volume of water in the cylinder would be recorded as

- 1) 75.7 ml
- 2) 75.70 ml
- 3) 84.3 ml
- 4) 84.30 ml

10. The diagram below represents a portion of a thermometer that is measuring the temperature of a solution.



According to the thermometer, the temperature of the solution is

- 1) 13.50°C
- 2) 13.5°C
- 3) 16.50°C
- 4) 16.5°C

11. Expressed to the correct number of significant figures, the sum of two masses is 445.2 grams. Which two masses produce this answer?

- 1) 210.10 g + 235.100 g
- 2) 210.100 g + 235.10 g
- 3) 210.1 g + 235.1 g
- 4) 210.10 g + 235.10 g

12. One kiljoule is the same as

- 1) 0.001 Joule
- 2) 0.01 Joule
- 3) 100 Joules
- 4) 1,000 Joules

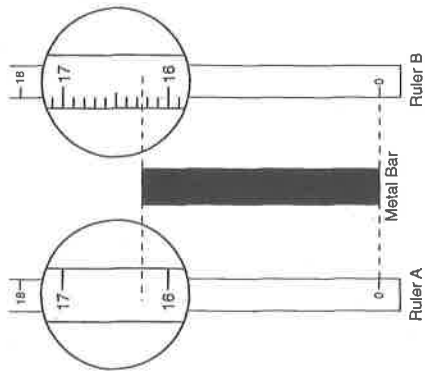
1.
2.
3.
4.
5.
6.
7.
8.
9.

10.
11.
12.
13.
14.
15.
16.
17.

18.
19.
20.
21.
22.
23.
24.
25.
26.

27.
28.
29.
30.
31.
32.
33.
34.
35.

13. The diagram below represents a metal bar and two centimeter rulers, *A* and *B*. Portions of the rulers have been enlarged to show detail.



What is the greatest degree of precision to which the metal bar can be measured by ruler *A* and by ruler *B*?

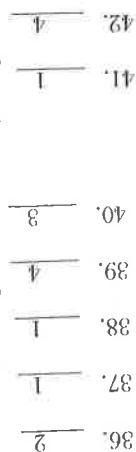
- 1) to the nearest tenth by both rulers
- 2) to the nearest hundredth by both rulers
- 3) to the nearest tenth by ruler *A* and to the nearest hundredth by ruler *B*
- 4) to the nearest hundredth by ruler *A* and to the nearest tenth by ruler *B*

14. Which quantity is equivalent to 50 kilojoules?

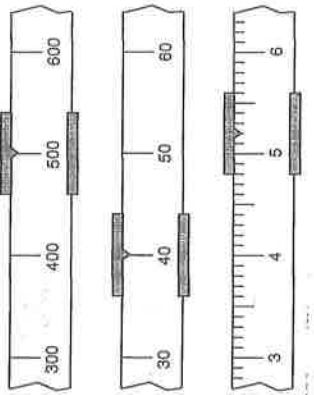
- 1) 5000 J
- 2) 0.05 J
- 3) 5×10^3 J
- 4) 5×10^4 J

15. How many kilojoules are equivalent to 10 Joules?

- 1) 0.001 kJ
- 2) 0.01 kJ
- 3) 1000 kJ
- 4) 10,000 kJ



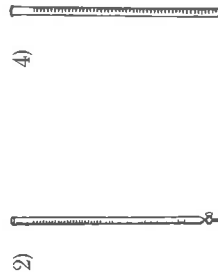
16. The diagram below represents a portion of a triple-beam balance.



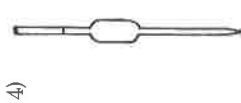
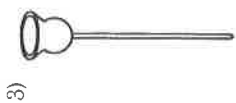
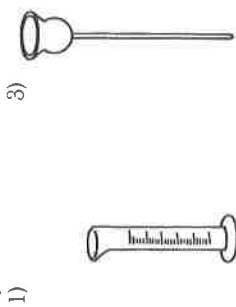
If the beams are in balance with the riders in the positions shown, what is the total mass of the object?

- 1) 540.20 g
- 2) 540.52 g
- 3) 545.20 g
- 4) 545.52 g

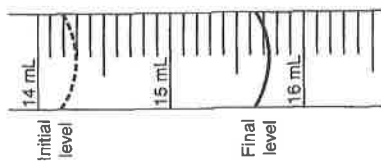
17. Which diagram below represents a pipette?



18. Which diagram represents a graduated cylinder?



22. The diagram below represents a section of a buret containing acid used in an acid-base titration.



What is the total volume of acid that was used?

- 1) 1.10 mL
- 2) 1.30 mL
- 3) 1.40 mL
- 4) 1.45 mL

19. A solution contains 12.55 grams of a solid dissolved in 50.0 milliliters of water. What is the number of grams of solid dissolved per milliliter of water, rounded to the correct number of significant figures?

- 1) 0.25 g/mL
- 2) 0.251 g/mL
- 3) 0.3 g/mL
- 4) 0.2510 g/mL

20. Which measurement contains a total of three significant figures?

- 1) 0.12
- 2) 0.12
- 3) 120
- 4) 120.

21. Which measurement contains three significant figures?

- 1) 0.05 g
- 2) 0.050 g
- 3) 0.056 g
- 4) 0.0563 g

23. What is the product of (2.324 cm \times 1.11 cm) expressed to the correct number of significant figures?

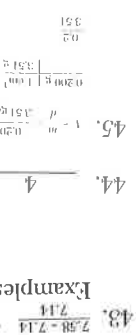
- 1) 2.58 cm²
- 2) 2.5780 cm²
- 3) 2.5796 cm²
- 4) 2.57964 cm²

24. What is the quotient of 8.01 grams divided by 3.127 grams, expressed to the correct number of significant figures?

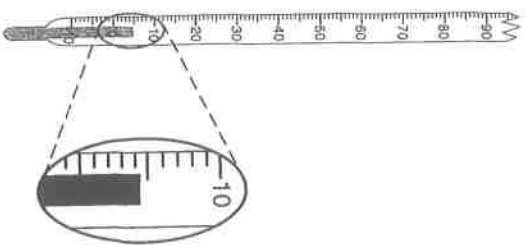
- 1) 2.6
- 2) 2.56
- 3) 2.562
- 4) 2.5616

25. What is the equivalent of 0 Kelvin on the Celsius scale?

- 1) -100°
- 2) 100°
- 3) -273°
- 4) 273°



26. The diagram below represents a Celsius thermometer recording a certain temperature.



What is the correct reading of the thermometer?

- 1) 5°C
- 2) 4.3°C
- 3) 0.3°C
- 4) 4°C

27. Which quantity expresses the sum of the given masses to the correct number of significant figures?

$$\begin{array}{r} 22.1 \\ 375.66 \\ + 5400.132 \\ \hline \end{array}$$

- 1) 5800 g
- 2) 5798 g
- 3) 5797.9 g
- 4) 5797.892 g

28. Which temperature is equal to +20 K?

- 1) -253°C
- 2) -293°C
- 3) 253°C
- 4) 293°C

29. A student found the boiling point of a liquid to be 80.4°C. If the liquid's actual boiling point is 80.6°C, the experimental percent error is equal to

$$1) \frac{80.6 - 80.4}{80.6} \times 100$$

$$2) \frac{80.6 - 80.4}{80.4} \times 100$$

$$3) \frac{80.5 - 80.4}{80.5} \times 100$$

$$4) \frac{80.5 - 80.4}{80.4} \times 100$$

30. A student determined the percentage of water of hydration in $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ by using the data in the table below.

Quantity Measured	Value Obtained
mass of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$	3.80 grams
mass of BaCl_2	3.20 grams
% of water calculated	15.79%

The accepted percentage value for the water of hydration is 14.75%. What is the student's percent error?

- 1) 1.04%
- 2) 6.00%
- 3) 6.59%
- 4) 7.05%

31. A student determined that the percent of H_2O in a hydrate was 39.0%. The percent of H_2O in this hydrate is 36.0% according to an accepted chemistry reference. What is the student's percent of error?

- 1) 9.1%
- 2) 8.3%
- 3) 3.0%
- 4) 11%

32. In an experiment the gram atomic mass of magnesium was determined to be 24.7. Compared to the accepted value 24.3, the percent error for this determination was

$$1) 0.400$$

$$2) 1.65$$

$$3) 24.7$$

$$4) 98.4$$

33. What is the safest method for diluting concentrated sulfuric acid with water?

- 1) add the acid to the water quickly
- 2) add the water to the acid quickly
- 3) add the acid to the water slowly while stirring
- 4) add the water to the acid slowly while stirring

34. Which activity is considered a proper laboratory technique?

- 1) heating the contents of an open test tube held vertically over a flame
- 2) heating the contents of a test tube that has been closed with a stopper
- 3) adding water to concentrated acids
- 4) adding concentrated acids to water

35. The temperature 30. K expressed in degrees Celsius is

- 1) 243°C
- 2) -243°C
- 3) 303°C
- 4) -303°C

36. A liquid's freezing point is -38°C and its boiling point is 357°C. What is the number of Kelvin between the boiling point and the freezing point of the liquid?

- 1) 319
- 2) 395
- 3) 592
- 4) 668

37. Energy is being added to a given sample. Compared to the Celsius temperature of the sample, the Kelvin temperature

- 1) will always be 273° greater
- 2) will always be 273° lower
- 3) will have the same reading at 0°
- 4) will have the same reading at 273°

38. A cube has a volume of 8.0 cm^3 and a mass of 21.6 grams. The density of the cube, in grams per cubic centimeter, is best expressed as

- 1) 2.7
- 2) 2.70
- 3) 0.37
- 4) 0.370

39. If the observed value for a density is 0.80 g/ml and the accepted value is 0.70 g/ml, what is the percent error?

- 1) 0.17%
- 2) 0.14%
- 3) 17%
- 4) 14%

40. In a laboratory exercise to determine the density of a substance, a student found the mass of the substance to be 6.00 grams and the volume to be 2.0 milliliters. Expressed to the correct number of significant figures, the density of the substance is

- 1) 3.000 g/ml
- 2) 3.00 g/ml
- 3) 3.0 g/ml
- 4) 3 g/ml

41. Which gas has approximately the same density as C_2H_6 at STP?

- 1) NO
- 2) NH_3
- 3) H_2S
- 4) SO_2

42. Which element has the greatest density at STP?

- 1) calcium
- 2) carbon
- 3) chlorine
- 4) copper

43. A student determines the density of zinc to be 7.56 grams per milliliter. If the accepted density is 7.14 grams per milliliter, what is the student's percent error?
- Show a correct numerical setup.
 - Record your answer.

44. Which element has the greatest density at STP?

- | | |
|--------------|--------------|
| 1) barium | 3) magnesium |
| 2) beryllium | 4) radium |

45. Base your answer to the following question on the following information.

Carbon and oxygen are examples of elements that exist in more than one form in the same phase.

Graphite and diamond are two crystalline arrangements for carbon. The crystal structure of graphite is organized in layers. The bonds between carbon atoms within each layer of graphite are strong. The bonds between carbon atoms that connect different layers of graphite are weak because the shared electrons in these bonds are loosely held by carbon atoms. The crystal structure of diamond is a strong network of atoms in which the shared electrons are strongly held by the carbon atoms.

Graphite is an electrical conductor, but diamond is not. At 25°C, graphite has a density of 2.2 g/cm³ and diamond a density of 3.51 g/cm³.

The element oxygen can exist as diatomic molecules, O₂, and as ozone, O₃. At standard pressure the boiling point of ozone is 161 K.

Calculate the volume, in cm³, of a diamond at 25°C that has a mass of 0.200 gram. Your response must include both a correct numerical setup and the calculated result.