Review #1 (Module 1-Quantitative skills)

Solve all the Questions and then check Answers from Ans key provided at the end.
Feel as if you are taking the Real Exam.

Ques. 1. Match the terms below with the definitions at the bottom.

1) _____ Tentative model or picture that offers an explanation for the behavior of a system.

2) _____ Generalization that summarizes in a concise way information about natural phenomena.

3) _____ Tentative model that has been tested and validated over long periods of time.

4) _____ A valid observation about some phenomenon

a) fact
b) scientific law
c) hypothesis
d) theory

Hint: Lecture on Scientific methods (chapter 1 of textbook)

Ques. 2. Indicate whether each of the following statements represents *quantitative* data or *qualitative* data.

a) A beaker containing calcium carbonate weighs 96.543 grams. _____
b) The gas in the container was reddish-brown in color. _____
c) The volume of a container of gas decreases as the pressure in the container increases. _____
d) A strip of magnesium ribbon is 1.24 centimeters in length. _____

Ques. 3. Express the following numbers in scientific notation.

a.	6,473	
b.	0.0004081	
c.	6,970,000	
d.	0.00021	

Ques. 4. Convert the following numbers from scientific notation to ordinary decimal notation.

a) 3.01×10^{-3} _____
b) 9.0×10^{-3} _____
c) 9.91×10^{5} _____
d) 6.429×10^{8} _____

Ques. 5. Round off each of the following numbers to 3 significant figures.

a) 397.48 _____
b) 145,120 _____

c) 0.00860 _____
d) 1900 _____

Ques. 6. The calculator answer obtained from multiplying 21.08 x 1.9634 is 41.388472. The answer to the correct number of significant figures is _____.

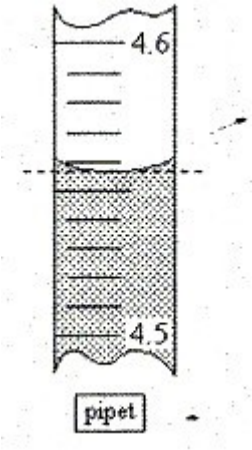
a) 41.388
b) 41.4
c) 41.39
d) 41.3884 Hint: Lecture on measurement (chapter 2 of textbook)

Ques. 7. What are the correct number of significant figures in the answer for the following sum:

8.650 + 19.6 + 44.05 + 88

a) 2
b) 3
c) 4
d) 5

Ques. 8. If you were recording the volume of liquid in the pipet depicted, what volume would you record (to the correct number of significant figures)?



a) 4.557 mL
b) 4.56 mL
c) 5 mL
d) 4.6 mL

Ques. 9. If the accepted value for the length of an object is 6.78 cm, which of the following sets of experimental results is best described as both precise *and* accurate?

a) 6.78 cm, 6.38 cm, 6.48 cm (average = 6.55 cm)
b) 6.79 cm, 6.78 cm, 6.77 cm (average = 6.78 cm)
c) 6.71 cm, 6.71 cm, 6.72 cm (average = 6.71 cm)
d) 6.88 cm, 6.88 cm, 6.58 cm (average = 6.78 cm)

Ques.10. Which statement contains an exact number?

a) A gross of paper contains 144 sheets.
b) One sheet of paper is 0.0042 inches thick.
c) One sheet of paper measures 8.5 x 11 inches.
d) A ream of medium weight paper weighs 20 pounds.

Ques.11. Which of the following is an *inexact* number?

a) There are 12 eggs in a dozen.
b) The conversion 1000 mm = 1 m.
c) This card measures 3.1 inches x 4.2 inches.
d) There are 2 cups in one pint.

Ques. 12. Find out: Hint: Lecture on measurement (chapter 2 of textbook)

Measured Number		Number of Significant Figures	Magnitude of Uncertainty
a	3.75	3	± 0.01
b	1.110		
c	0.006		
d	7080		

Ques.13. Fill in the Table:

	Metric Prefix	Abbreviation for Prefix (Symbols)	Mathematical Meaning of Prefix
Example	centi-	c	10^{-2}
a	kilo-		
b	hecto-		
c	deka		

d	deci-		

Ques. 14. Express each number in scientific notation.

a) 50,008

b) 263

c) 0.000635

d) 0.0007004

Ques.15. Express each number in decimal notation.

a) 1.200×10^{3}

b) 5.00013×10^{2}

c) 7.17×10^{-3}

d) 4.44×10^{-4}

Ques. 16. Which of the following units of measure is equivalent to a cm^3 (cubic centimeter)?

a) mL
b) mm
c) mg
d) g

Ques.17. State the freezing point of water on Kelvin scale?

a) 32^0F
b) 0^0C
c) 273K
d) 0^0K

Ques. 18. Rounding off each of the following measured numbers to three significant figures.

a) 0.01114

b) 5.2282

c) 21.55

d) 21.45

e) 32202

Ques. 19. What volume of a solution with a density of 13.9 g/mL is needed to provide 155 grams of solution?

a) 11.2 mL
b) 106 mL
c) 0.185 mL
d) 2150 mL

Hint : lecture video on unit system and dimensional analysis

Ques. 20. Using the dimensional analysis method of problem solving, carry out the following metric-metric conversions:

a) 17.2 cm = ? m Hint: Conversion of cm to m; 1cm =0.01 m, See Table 2.3 in textbook Chapter 2 or in lecture video on Unit and dimensional analysis.

b) 257 mL = ? dL Hint: Conversion of mL to L to dL 1mL =0.001L, and 1 dL = 0.1 L

Ques. 21. Show the conversion factors in converting **(I)** 2.2 yard to meters **(II)** 2.2 m to inches?

Hint (I) 1m = 1.094 yd ; (II) 1m = 39.37 in.

Ques. 22. Show the conversion factors involved in converting kilometer to millimeter?

Hint: Km – m – mm

Ques.23. How many grams of alcohol are contained in 22.4g of a mixture of alcohol and water solution that is 11.2% solution by mass?

Hint : % Solution = (mass of alcohol / Total mass) x 100

Ques.24. You have a different rock with a volume of 30.0 cm^3 and a mass of 60.0 g. What is its density in g/mL? Hint: $1cm^3$=1mL ; D = m / v

Ques. 25. The accepted length of an aluminum rod is 34.0 cm. Two students were asked to determine the length of a rod experimentally. Their results are:

Student 1 33.7 cm

Student 2 34.2 cm

Calculate the percentage error with each result. ?

Hint: $\%\,Error = \frac{measured\ value - accepted\ value}{accepted\ value}\ X\ 100$

Ans Key for Review # 1

1. 1) c 2) b 3) d 4) a
2. a) quantitative b) qualitative c) qualitative d) quantitative
3. a) 6.473×10^3 ; +/- 1 b) 4.081×10^{-4} ; +/- 0.0000001 c) 6.97×10^6 ; +/- 10000
   d) 2.1×10^{-4} ; +/- 0.00001
4. a) 0.00301 b) 0.0090 c) 991,000 d) 642,900,000
5. a) 397 b) 145,000 c) 0.00860 d) 1.90×10^3
6. c
7. a
8. a
9. b
10. a
11. c
12. b) 4, ± 0.001 c) 1, ± 0.001 d) 3, ± 10
13. a) k, 10^3 b) h. 10^2 c) da, 10^1 d) d, 10^{-1}
14. a) 5.0008×10^4 b) 2.63×10^2 c) 6.35×10^{-4} d) 7.004×10^{-4}
15. a) 1,200 b) 500.013 c) 0.00717 d) 0.000444
16. a
17. c
18. a) 0.0111 (Rule 1) b) 5.23 (Rule 2) c) 21.6 (Rule 3 odd) d) 21.4 (Rule 3 even)
    e) 32,200 (Placeholder zeroes)
19. a
20. a) $17.2\ \text{cm} \times \left[\frac{10^{-2}\ \text{m}}{1\ \text{cm}}\right] = 0.172\ \text{m (calc and corr)}$
    b) $257\ \text{mL} \times \left[\frac{10^{-3}\ \text{L}}{1\ \text{mL}}\right] \times \left[\frac{1\ \text{dL}}{10^{-1}\ \text{L}}\right] = 2.57\ \text{dL (calc and corr)}$
21. I) Ans. 2.0 m II) 87 in.
22. 1km = 1000m and 1mm = .001 m
23. Ans. 2.51 g

24. Ans. 2.00 g/mL

25. Ans -0.882% for student 1 and +0.588 % for student 2