

Arcada University Of Applied Sciences

Plastics Technology

Entrance Examination, 7/Aug./2012

Time: 2h30m

Mathematics, Logical deduction, Physics and Chemistry

Mathematics

- The correct result alone will not be accepted as a solution, but must be accompanied by detailed calculations required to achieve the result

Q1

Solve the following equations

(a) $\sqrt{x+3} - 2 = x - 1$

(b) $2x^2 - 4x + 20 = 20$

(c) $\frac{1}{x} + \frac{1}{x-1} = \frac{1}{8x} + \frac{1}{8(x-1)}$

Q2

A triangle has sides $a = 2$, $b = 3$ and angle $C = 40^\circ$. Find side c and the sine of angle B .

Q3

Solve using the vertex of quadratic function

A TV cable company has 4800 subscribers who are each paying \$18 per month. It can get 150 more subscribers for each \$0.50 decrease in the monthly fee. Find the revenue equation, what monthly rate will yield maximum revenue, and what will this revenue be?

Q4

An electric utility company charges residential customers 11.5 cents per kilowatt hour plus a base charge each month. One customer's monthly bill comes to \$51.65 for 380 kilowatt hours. Find a linear function that describes the total monthly charges for electricity if x is the number of kilowatt hours used in a month.

Logical Deduction

Q5

A chemist needs to mix a 75% saltwater solution with a 50% saltwater solution to obtain 10 liters of a 60% saltwater solution. How many liters of each solution must be used?

Q6

A 90 liter water tank has an inlet pipe and a drain pipe. A full tank can be emptied in 30 minutes if the drain is opened and an empty tank can be filled in 45 minutes with the inlet pipe opened. If both pipes are accidentally opened when the tank is full, then how long will it take to empty the tank?

Q7

1000 tickets were sold to a movie. Adult tickets cost \$ 8.50, children's cost \$ 4.50, and a total of \$ 7300 was collected. How many tickets of each kind were sold?

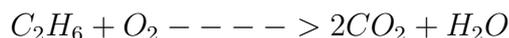
Physics and Chemistry
Directions

- Answer either A (Physics) or B (Chemistry). If you solve both, the one with lower score will count.

Q8

(A) On a high way at night you see a stalled vehicle and brake your car to a stop with an acceleration of magnitude $5m/s^2$. What is the car's stopping distance if its initial speed is $15m/s$?

(B) Balance the following chemical equation.



Q9

(A) A 10 kg box rests on a table

- (a) Determine the weight W of the box and normal force F_N acting on it
- (b) Determine W and F_N if a force of $40N$ pushes down on the box

(B) Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL. The molality of the solution is

- (a) 1.14 mol kg⁻¹
- (b) 3.28 mol kg⁻¹
- (c) 2.28 mol kg⁻¹
- (d) 0.44 mol kg⁻¹

Q10

(A) A man walks 5 m at 37° north of east and then 10 m at 60° west of north. What is the magnitude and direction of his net displacement?

(B) At $25^\circ C$ and 760 mm of Hg pressure a gas occupies 600 mL volume. What will be its pressure at a height where temperature is $10^\circ C$ and volume of the gas is 640 mL.