Practice Problems

A post CABG patient who weighs 143 lbs. is entering your cardiac rehabilitation program and is participating in your study concerning hemodynamic responses of cardiac patients to exercise. During his exercise sessions, he will be exercising as a 4 MET workload and will undergo invasive hemodynamic monitoring that quantifies cardiac output.

1. Calculate the speed at which you would set a horizontal treadmill to elicit the 4 MET workload.

2. Calculate the %grade you would use to elicit the 4 MET workload if the belt speed was 2 mph.

3. Calculate the resistance that you would set one the monarch bike at 50 RPM to elicit the 4 MET workload.

4. During data collection for the study, it was determined that while exercising at the 4 MET level, his cardiac output was 7 liters per minute, his venous blood oxygen saturation was 34%, and his [Hb] was 16 gram%. Calculate his arterial blood oxygen saturation.

1. 3.92 or 4 mph (105 meters/min)
2. 5%
3. .84 kg
4. 94.68%

1. An 190 lb. individual exercises 15 minutes on the monarch bike at 4 kg at 50 RPM. Compute his VO_2 in relative terms and his total caloric expenditure.

2. Determine the cardiac output and stroke volume for an individual with the following parameters.

VO_2 = 1190 ml/min
[Hb] = 15 gm %
SaO_2 = 95 %
SvO_2 = 50 %
Heart Rate = 85 bpm

1. VO2 = 32 ml/kg/min — Caloric Expenditure = 207 Kcal
2. Q = 13.16 liters/min. — SV = .16 liters/beat

1. A client in your corporate fitness facility who weighs 155 lbs. was determined to have a maximum oxygen consumption of 45 ml/kg/min. What is his oxygen consumption in absolute terms? In METS?

2. A 185 lb. man is exercising on a monarch bike at a 10 MET intensity level. What is his oxygen consumption in relative terms? How many calories will he expend in a 30 minute workout? What resistance (kg's) is the bike set to if he is pedaling at 60 rpm?

1. 3170.25 ml/min 12.86 METS
2. 35 ml/kg/min 441 kcal 3.6 kg

METABOLIC CALCULATION SAMPLE PROBLEMS

1. SUBJECT: 180 lbs VO2 = 3.7 liters/min.
   COMPUTE: MET level of exercise rate of caloric expenditure

2. SUBJECT: 200 lbs exercise intensity level = 9.5 METS
   COMPUTE: VO2 in both absolute and relative terms
   calories expended during 25 minutes of exercise

3. SUBJECT: 165 lbs HR = 165 SV = 70 ml/beat
   VO2 = 44.5 ml/kg/min.
   COMPUTE: a-v O2 difference MET level of exercise
   calories expended during 40 minutes of exercise

4. SUBJECT: 155 lbs exercising at 7 METS for 20 min.
   [Hb] = 17 gm% HR = 140 SV = 135 ml/beat SvO2 = 50%

   COMPUTE: speed to set treadmill at 10% grade
   total caloric expenditure
   SaO2

5. SUBJECT: 85 kg man running on a treadmill - 8 mph - 5% grade
   COMPUTE: the amount of weight he could expect to loose in 16 weeks strictly as a result of the exercise regimen defined above (frequency = 4 times/week, duration = 45 minutes). and a diet which limits caloric intake to 1800 kcals/day. Assume that his average daily metabolism is 2000 kcals, he has the weight to loose and all other metabolic influences are negligible.

6. SUBJECT: HR = 70 beats/min. SV = 85 ml/beat
   SaO2 = 98% SvO2 = 72%
   Hb concentration = 17 gm/100ml of blood
   Hb O2 carrying capacity = 1.34 ml O2/gm of Hb

   COMPUTE: VO2

Answers

1. 12.9 METS 18.5 kcal/min
2. 33.25 ml/kg/min 3022.4 ml/min 377.5 kcal
3. 288.96 ml O_2/liter blood 12.7 METS 666.8 kcal
4. 2.8 mph 172.6 kcal 90%
5. 25 lbs.
6. 352.41 ml/min