Student name:\_\_\_\_\_\_\_\_\_\_

**MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.  
1)** Work is defined as

A) the ability to transform energy from one state to another.   
 B) the ability to utilize oxygen.  
 C) the product of force times distance.  
 D) the product of distance times power output.

**2)** Power is defined as

A) the ability to perform work.   
 B) work divided by the amount of time required to perform the work.  
 C) the product of work times force (Work × force).  
 D) the product of force times distance (force × distance).

**3)** The SI unit for work is the

A) joule.   
 B) watt.  
 C) kpm.  
 D) kcal.

**4)** Direct calorimetry is a means of determining energy expenditure and involves the measurement of

A) oxygen consumption.   
 B) heat production.  
 C) ATP hydrolysis.  
 D) carbon dioxide production.

**5)** The energy cost of horizontal running can be estimated accurately because

A) the VO 2 of running is always the same.   
 B) the VO 2 of horizontal running is always 1 MET.  
 C) the VO 2 increases linearly with running speed.  
 D) none of these answers is correct.

**6)** The most common technique used to measure oxygen consumption in an exercise physiology laboratory is

A) closed-circuit spirometry.   
 B) open-circuit spirometry.  
 C) direct calorimetry.  
 D) computer calorimetry.

**7)** One MET is defined as a metabolic equivalent and is equal to

A) resting VO 2.   
 B) 50% of resting VO 2.  
 C) 200% of resting VO 2.  
 D) VO 2 max.

**8)** Net efficiency is defined as

A) work output/energy expended at rest multiplied by 100.   
 B) work output/energy expended above rest multiplied by 100.  
 C) work output/energy expended multiplied by 100.  
 D) energy expended/work output multiplied by 100.

**9)** Exercise efficiency is greater in subjects who

A) possess a higher percentage of fast muscle fibers.   
 B) possess a higher percentage of slow muscle fibers.  
 C) possess 50% fast fibers and 50% slow fibers.  
 D) None of these answers is correct.

**10)** To achieve the highest efficiency during exercise, the optimum speed of movement

A) increases as the power output increases.   
 B) decreases as the power output increases.  
 C) remains constant as the power output increases.  
 D) increases as the power output decreases.

**11)** The SI units used to describe power are

A) Newtons.   
 B) joules.  
 C) watts.  
 D) joules per second.

**12)** Net efficiency \_\_\_\_\_\_\_\_\_\_\_\_\_\_ as work rate increases.

A) increases   
 B) does not change  
 C) decreases  
 D) follows a sine wave pattern

**13)** A kilocalorie is equal to

A) 100 calories.   
 B) 1,000 calories.  
 C) 4,186 kilojoules.  
 D) 4.186 joules.

**14)** In order to standardize terms for the measurement of energy, power, work, etc., scientists have developed a common system of terminology called

A) the English system.   
 B) the metric system.  
 C) system international units (SI).  
 D) None of these answers is correct.

**15)** The incline of a treadmill is expressed in units called percent grade. Percent grade is defined as

A) the angle of the treadmill expressed in degrees.   
 B) the amount of horizontal travel of the treadmill belt per minute.  
 C) the hypotenuse divided by the vertical rise.  
 D) the vertical rise per 100 units of belt travel.

**16)** The term ergometry refers to

A) the measurement of heat production.   
 B) the measurement of work output.  
 C) the hypotenuse divided by the vertical rise.  
 D) the vertical rise per 100 units of belt travel.

**17)** Calculating the work performed on a cycle ergometer requires that you know all of the following *except*

A) subject's body weight.   
 B) resistance against flywheel.  
 C) pedaling speed (i.e., distance traveled).  
 D) duration of exercise.

**18)** Compared to a highly economical runner, runners that exhibit poor running economy would require

A) a lower VO 2 at any given running speed.   
 B) a higher VO 2 at any given running speed.  
 C) the same VO 2 at any given running speed.  
 D) None of these answers is correct.

**19)** The treadmill angle (expressed in degrees) can be determined by

A) visual inspection of the angle of the treadmill.   
 B) trigonometric computations.  
 C) using a measurement device called an inclinometer.  
 D) Both trigonometric computations and using a measurement device called an inclinometer answers are correct.

**20)** The measurement of oxygen consumption during exercise can provide an estimate of metabolic rate. The rationale behind the use of oxygen consumption to estimate metabolic rate is:

A) that measurement of oxygen consumption provides a direct estimate of how much carbohydrate is used a fuel source.   
 B) that a direct relationship exists between oxygen consumed and the amount of heat produced in the body.  
 C) that measurement of oxygen consumption provides a direct estimate of how much fat is used a fuel source.  
 D) None of these answers is correct.

**21)** During cycle ergometer exercise, net efficiency decreases as the work rate increases. The mechanism to explain this observation is

A) the relationship between energy expenditure and work rate is curvilinear rather than linear.   
 B) the energy requirement of exercise decreases as work rate increases.  
 C) that, independent of work rate, oxygen consumption during exercise always increases over time.  
 D) None of these answers is correct.

**22)** Calculate the power output when an individual performs 700 joules of work in one minute.

A) 11.7 watts   
 B) 117 watts  
 C) 42,000 watts  
 D) Power cannot be calculated with the information provided.   
1 watt = 1 joule per second

**23)** A subject performing a 10-MET activity would have an oxygen consumption of approximately

A) 10 ml•kg -1•min -1.   
 B) 25 ml•kg -1•min -1.  
 C) 35 ml•kg -1•min -1.  
 D) 45 ml•kg -1•min -1.

**24)** Calculate the total amount of work performed in 5 minutes of exercise on a cycle ergometer, given the following:   
   
Resistance on flywheel = 30 Newtons   
Cranking speed = 50 revolutions per minute   
Distance traveled per revolution = 6 meters   
1 joule = 1 newton-meter

A) 9,000 joules   
 B) 4500 joules  
 C) 45,000 joules  
 D) Total work performed cannot be calculated given the information above.   
 1 joule = 1 Newton-meter

**25)** Compute the power output (watts) during 60 seconds of treadmill exercise, given the following:   
   
Treadmill grade = 10%   
Horizontal speed = 100 meters per minute   
Subject's body weight = 60 kg (i.e., force = 588.6 Newtons)   
1 joule = 1 newton-meter   
1 watt = 1 joule per second   
1 kcal = 426.8 kpm

A) 98.1 watts   
 B) 981 watts  
 C) 5886 watts  
 D) Power output cannot be calculated given the information above.

**26)** Calculate net efficiency, given the following:   
   
Resting VO 2 = 0.25 liters per minute   
Exercise VO 2 = 1.50 liters per minute   
Work rate = 100 watts (W) or 612 kilopond meters per minute   
1 watt = 1 joule per second   
1 kcal = 4186 joules   
1 liter VO 2 = 5 kcal or 20,930 joules

A) approximately 19%   
 B) approximately 20%  
 C) approximately 23%  
 D) approximately 28%

**Answer Key**Test name: Unnamed Test001

1) C

2) B

3) A

4) B

5) C

6) B

7) A

8) B

9) B

10) A

11) C

12) C

13) B

14) C

15) D

16) B

17) A

18) B

19) D

20) B

21) A

22) A

23) C

24) C

25) A

26) C