Physics Assessment Tune-up

Calculators are permitted and formula sheet supplied for the test.

You may also telephone BCIT at 604-451-6832 for more information.

1. A wooden raft, 5-feet long and 4-feet wide, floats in water. When a person steps on the raft, it sinks 1.5 inches deeper into the water. Calculate the person's weight. Density of water: 62.4 lb/ft^3.

2. Find the specific gravity of a substance that has a mass of 148.5 g and a volume of 30.5 cm^3.

3. At 100°C a gas occupies a volume of 2.5 m^3. What will be its volume at 0°C?

4 A steel plate measures 3′ x 5′. If the pressure is 30 lb/in^2, calculate the force on the plate.

5. A car accelerates from a velocity of 15 m/sec to 25 m/sec in 2 seconds. Calculate the acceleration.

6. A man carries a load of 50 Kg to a height of 15 m in 5 minutes. Calculate a) the work done, b) the power extended.

7. A truck changes its velocity from 30 m/s to 10 m/s in 5 seconds. How far does it travel during the change?

8. A 3000-Kg is hoisted 2 m above the ground. Calculate its potential energy.

9. A force of 3000 N moves a mass of 500 Kg a distance of 8 m in 15 seconds. How much work has been done?

10. A screw jack has a pitch of 1/2″ and is turned with a bar 4′ long. Calculate a) the MA, b) the load that can be lifted (theoretically) with a force of 50 lbs, c) the efficiency of the machine if a load of 10,000 lbs is lifted.

11. A steel bar 1.5 m long is used to lift a stack of plates. If the fulcrum is 5 cm from the end of the bar and a force of 500 N is used, calculate a) the MA, b) the resistance force.

12. A steel rod 90 cm long is heated from 15°C to 90°C. Calculate the increase in length if the coefficient of linear expansion is 0.000012/°C.

13. How much energy does it take to change a 750 g block of ice at –5°C to steam at 135°C?

14. A block of aluminum measures 80 cm x 60 cm x 50 cm. It is heated from 25°C to 500°C. Calculate its increase in volume. Coefficient of linear expansion is 0.0000221/°C.

15. A 12V battery is connected to parallel resistors of 9Ω and 18Ω. How much power is consumed by the total resistance?

16. A lamp is designed to operate on 6V and draw a current of 40 mA. It is connected to 9V. What size resistor must be connected in series?

    Hint: Find resistance of the lamp when it is drawing 40 mA.

Answers:

1. 156 lb
2. 4.9:1
3. 1.8 m^3
4. 64,800 lb
5. 5 m/s^2
6. 7350J, 24.5W
7. 100 m
8. 58.8 KJ
9. 24 KJ
10. 603:1, 30150 lb, 33 %
11. 29:1 14500 N
12. 0.08 cm
13. 555 Kcal, or 2.32 MJ
14. 7558 cm^3
15. 24W
16. 75Ω

Physics Assessment Test Formulas

$F = A \times P$

$F = m \times g$ ($wt = m \times g$)

$A = L \times W$

$g = 9.8 m/s^2$

$g = 32\ ft/s^2$

$D = m/V$ ($D = wt/V$)

$V = L \times W \times H$

$D_{water} = 62\ {lb}/{ft^3} = 1000\ {kg}/{m^3}$

Buoyant force = wt in air – wt in water

$$\text{sp.gr.} = \frac{wt\_in\_air}{buoyant\_force}$$

$$\text{sp.gr.} = \frac{\text{mass density}}{\text{mass density of water}}$$

Absolute pressure = gauge pressure + atm pressure

$$\frac{V_1}{V_2} = \frac{T_1}{T_2}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

(P are absolute pressures and T are absolute temperatures)

$K^o = C^o + 273$

$R^o = F^o + 460$

$$\frac{E}{R} = \frac{RD}{ED}$$

$P = {F}/{A}$

$$v = \frac{d}{t}$$

$$a = \frac{v}{t}\ (v = \text{final velocity},\ v_0 = 0)$$

$$a = \frac{vf - vo}{t}$$

$d = 1/2\ at^2$ if $v_0 = 0$

$f = m \times a$

1 mph = 1.47 ft/s

$W = F \times d$

$P = W/t$

$KE = \text{work} = Fxd = 1/2\ mv^2$

$PE = mgh$ ($F \times h$)

$Q = mc\Delta T$

Q (lost) = Q (gained)

$Q = mL_f$

$Q = mL_v$

$\Delta L = aL_O\Delta T$

$\Delta V = bV_O\Delta T$

$$\frac{Q}{t} = \frac{kA\Delta T}{d}$$

$$R = \frac{d}{k}$$

$Rt = R1 + R2 + \ldots$

$E = IR$

$P = EI$

$BTU = W \times \Delta T \times SH$

S.H. $H_2O = 1$ Fusion = $144\ {BTU}/{lb}$

S.H. Ice = 0.53

S.H. Steam = 0.48 Vaporization = $970.4\ {BTU}/{lb}$

$KJ = M \times \Delta T \times SH$

S.H. $H_2O = 4.186$ Fusion = $335\ {KJ}/{kg}$

S.H. Ice = 2.093

S.H. Steam = 2.009 Vaporization = $2260\ {KJ}/{kg}$