

FINAL_EXAM_SPH3U_JUN2010

PART A - True/False [1 mark each]

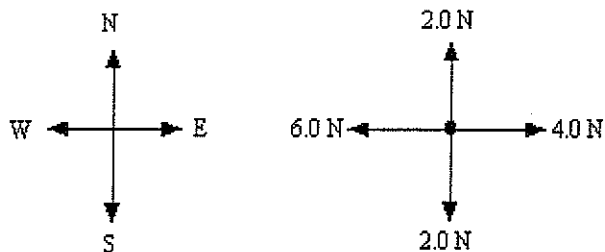
Indicate whether the statement is true or false. If the statement is True, shade A, if the statement is False, shade B.

1. The reason your head feels like it jerks backward when pulling away from a stop sign is best explained by Newton's Third Law.
2. If two forces that are identical in strength but exactly opposite in direction act on the same object, that object must necessarily be motionless.
3. When drawing a proper free-body diagram, all forces, including the net force acting on the object, must be clearly indicated.
4. A direct current always flows in the same direction in a circuit.
5. The direction of electron flow is from a negative terminal to a positive terminal in a circuit.
6. A $10\text{-}\Omega$ resistor removes more energy from a circuit than a $20\text{-}\Omega$ resistor.
7. Positive work means that the work done is greater than the force of friction.
8. A car with mass m moving with a speed of $4v$ has the same kinetic energy as a car of mass $16m$ moving with a speed of v .
9. When two waves are in phase, they only need to have the same speed.
10. In a longitudinal wave, the particles in the medium move in a direction perpendicular to the direction of the wave.

PART B - Multiple Choice [1 mark each]

Identify the choice that best completes the statement or answers the question.

11. The free-body diagram of a 4.0-kg object is shown below. What additional force must act so that the object has an acceleration of 2.5 m/s^2 [W]?

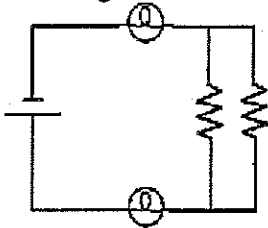


- a. 14.0 N [W]
- b. 10.0 N [W]
- c. 8.0 N [W]
- d. 6.0 N [W]
- e. 4.0 N [W]

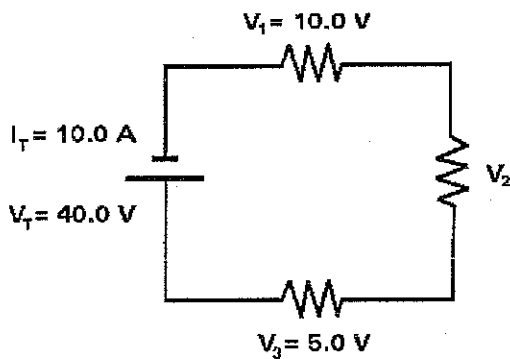
12. A 2.5×10^3 kg car is travelling due west at 30 m/s when the brakes are applied, exerting a force of 5.0×10^3 N [E]. What is the car's acceleration due to the braking?
- 2.0 m/s^2 [W]
 - 2.0 m/s^2 [E]
 - 15 m/s^2 [W]
 - 15 m/s^2 [E]
 - 2.0 m/s [E]
13. Which particles in an atom have an electrical charge?
- proton and neutron
 - electron and proton
 - neutron and electron
 - neutron and nucleus
 - all of the above
14. How many seconds will it take for 10.0 C of charge to pass through a 12.0 A circuit?
- 120 s
 - 0.120 s
 - 0.833 s
 - 100 s
 - 1.20 s
15. In circuits, the term electron flow refers to
- the direction of electron movement
 - the direction of the electric current
 - the rate of electron movement
 - the number of electrons
 - the total charge of the electrons
16. Which of the following equations could be used to calculate the potential difference in a circuit, if all variables are given?
- $V = \frac{E}{Q}$
 - $V = \frac{E}{I\Delta t}$
 - $V = \frac{E}{Ne}$
 - all of the above
 - none of the above
17. What is the potential difference of a battery if it provides 250 J of energy to a load in a 12.0 A circuit in 2.3 s?
- 9.1 V
 - 6.9×10^3 V
 - 48 V
 - 1.35×10^3 V
 - 28 V
18. An electron has a mass of 9.11×10^{-31} kg. Originally, it is at rest. What speed will the electron have after it is accelerated through a potential difference of 5.67×10^3 V?
- 5.67×10^3 m/s
 - 1.99×10^{15} m/s
 - 4.46×10^7 m/s
 - 3.16×10^7 m/s
 - 3.00×10^8 m/s
19. Which device would most likely be classified as a load in an electrical circuit?
- battery
 - light bulb
 - ammeter
 - cell
 - none of the above

20. In what type of circuit do electrons follow one path from the source, to a load, and back to the source?
- short circuit
 - open circuit
 - parallel circuit
 - series circuit
 - connected circuit
21. If ten 9.0-V sources are connected in parallel to each other, the total potential difference in the circuit will be
- 0.90 V
 - 1.1 V
 - 9.0 V
 - 90 V
 - 900 V

22. This diagram that follows shows



- two lamps in series and two resistors in parallel
 - two lamps in series and two resistors in series
 - two lamps in parallel and two resistors in series
 - two lamps in parallel and two resistors in parallel
 - two lamps in series, one resistor in series, and one resistor in parallel
23. The value of V_2 in the following circuit is



- 40 V
 - 35 V
 - 25 V
 - 15 V
 - 10 V
24. A construction worker does 450 J of work in lifting a load of bricks from the ground to a support stand 1.50 m from the ground. What was the mass of the bricks she lifted?
- 300 kg
 - 3.06 kg
 - 68.9 kg
 - 0.327 kg
 - 30.6 kg

PART C - WORD PROBLEM

Answer all questions in the space provide. Show your works whenever appropriate by clearly indicating all known values, unknown variables, implied values and calculation using appropriate formula

36. Why are free-body diagrams considered an essential first step in solving dynamics problems? [2 marks]

37. A water wave travels from shallow water (slower medium) into deeper water (faster medium). What happens to the wavelength and frequency of the water wave? [2 marks]

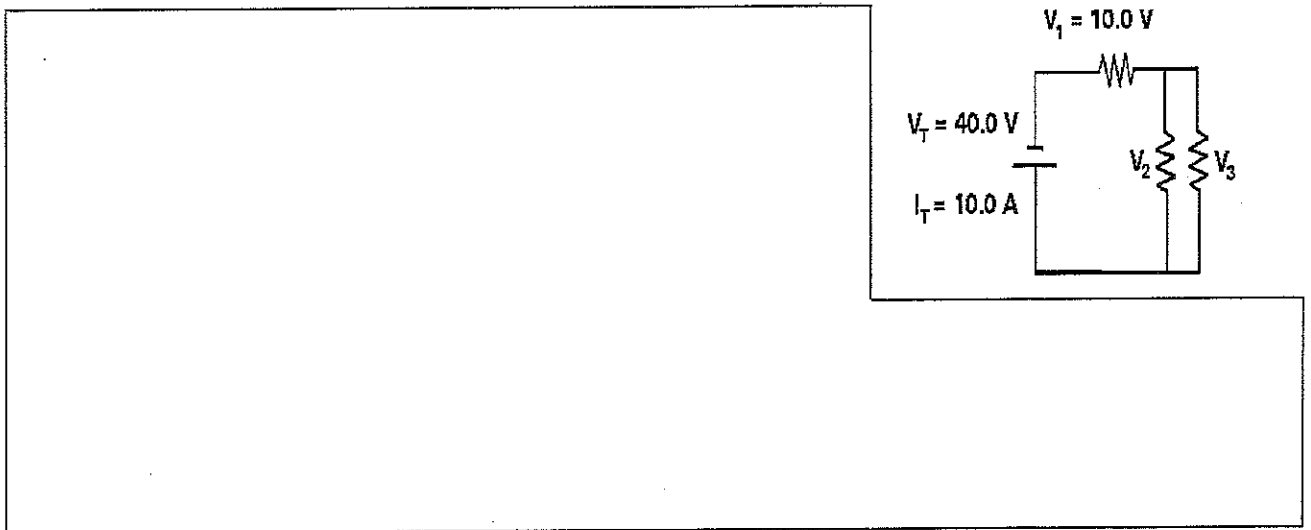
38. A neutral pith ball was given a charge of -3.0×10^{-7} C. Calculate the number of electrons transferred to the pith ball.[2 marks]

39. A 120-V circuit contains a load with a resistance of 15.0Ω . What resistance must be added in parallel with the load to result in a current of 12.0 A in the circuit? [2 marks]

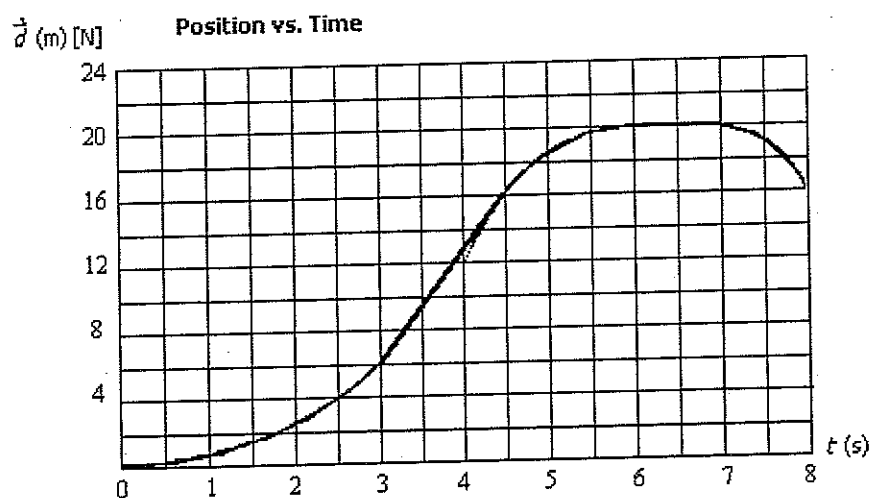
40. How much time, in hours, will it take a 855-W toaster to use 3.39×10^7 J of energy? [2 marks]

41. The distance between two successive crests in a wave is 1.5 m, and the source generates 25 crests and 25 troughs in 5.0 s. What is the speed of the waves? [4 marks]

42. Assuming that all resistors are identical, calculate the value of I_3 (the current passing through V_3) in the following circuit diagram (Hint: Name the unknown resistor corresponding to V_1, V_2 and V_3 as R_1, R_2, R_3 respectively) [5 marks]



43. Study the position-time graph pictured below and answer the questions that follow.



(a) From the graph, what is the object's final displacement? [Hint: direction of motion is towards North] [1 mark]

(b) What is the object's average velocity during the interval from $t = 3.0$ s to $t = 7.0$ s? [2 marks]

(c) What is the object's velocity during the time its motion is uniform? [3 marks]

(d) What is the object's average speed during the entire interval? [2 marks]

44. A family has its television set on for an average of 4.0 h per day. If the television set is rated at 80 W and energy costs \$0.050 per kW. h

a) find the total time, in hours, h, that the television set is typically on during 30 days [2 marks]

b) find the total amount of energy consumed during the 30 days period of time. [2 marks]

c) find the cost of operating the television set 4.0 h per day for 30 days? [2 marks]

45. A light bulb designed to for use with a 220 V power supply has a filament with a resistance of 500 Ω . If the bulb is unknowingly connected to a 120 V power supply, what would be the power output of the bulb? [2 marks]