FINAL_EXAM_SPH3U_JUN2010

PART A - True/False [1 mark each]

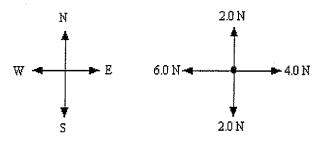
Indicate whether the statement is true or false. If the statement is True, shade A, if the statement is False, shade B.

- 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 $10-\Omega$ resistor removes more energy from a circuit than a $20-\Omega$ 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 16 m 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/s² [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]

- A 2.5×10^3 kg car is travelling due west at 30 m/s when the brakes are applied, exerting a force of 12. 5.0×10^3 N [E]. What is the car's acceleration due to the braking? a. 2.0 m/s² [W]
 b. 2.0 m/s² [E] d. $15 \text{ m/s}^2 [E]$ e. 2.0 m/s [E] c. $15 \text{ m/s}^2 \text{ W}$ Which particles in an atom have an electrical charge? 13. a. proton and neutron d. neutron and nucleus e. all of the above b. electron and proton c. neutron and electron How many seconds will it take for 10.0 C of charge to pass through a 12.0 A circuit? 14. d. 100 s a. 120 s b. 0.120 s e. 1.20 s c. 0.833 s In circuits, the term electron flow refers to 15. a. the direction of electron movement d. the number of electrons b. the direction of the electric current e. the total charge of the electrons c. the rate of electron movement Which of the following equations could be used to calculate the potential difference in a circuit, if 16.
- Which of the following equations could be used to calculate the potential difference in a circuit, all variables are given?

 a. $V = \frac{E}{Q}$ b. Ee. none of the above
 - $c. \quad V = \frac{1}{I \triangle i}$

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? a. 9.1 V d. $1.35 \times 10^3 \text{ V}$
 - b. $6.9 \times 10^3 \text{ V}$ e. 28 V
 - c. 48 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 though a potential difference of 5.67×10^3 V?
 - a. 5.67×10^3 m/s d. 3.16×10^7 m/s
 - b. $1.99 \times 10^{15} \text{ m/s}$ e. $3.00 \times 10^8 \text{ m/s}$
 - c. $4.46 \times 10^7 \,\text{m/s}$
- 19. Which device would most likely be classified as a load in an electrical circuit?
 - a. battery

d. cell

b. light bulb

e. none of the above

c. ammeter

- 20. In what type of circuit do electrons follow one path from the source, to a load, and back to the source?
 - a. short circuit

d. series circuit

b. open circuit

e. connected circuit

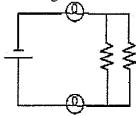
- c. parallel circuit
- 21. If ten 9.0-V sources are connected in parallel to each other, the total potential difference in the circuit will be
 - a. 0.90 V

d. 90 V

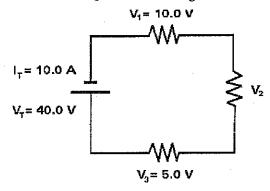
b. 1.1 V

e. 900 V

- c. 9.0 V
- 22. This diagram that follows shows



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



a. 40 V

d. 15 V

b. 35 V

e. 10 V

- c. 25 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?
 - a. 300 kg

d. 0.327 kg

b. 3.06 kg

e. 30.6 kg

c. 68.9 kg

25. Assuming that g is constant, which of the following expressions describes the total work done by an arrow travelling vertically upward?

a.
$$Fd = mgh + \frac{1}{2}mv^2$$

$$Fd = \frac{1}{2}mv^2 - mgh$$

b.
$$Fd = mh$$

e.
$$Fd = mgh$$

c.
$$Fd = \frac{1}{2}mv^2$$

26. A 40.0-kg girl rides her 0.50-kg skateboard. She starts from rest and at a constant acceleration reaches 3.0 m/s in 10 s on a horizontal surface. How much power did she use?

a.
$$6.1 \times 10^1 \text{ W}$$

d.
$$1.3 \times 10^{0} \text{ W}$$

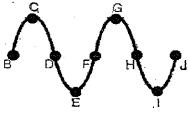
b.
$$1.2 \times 10^3 \text{ W}$$

e.
$$1.8 \times 10^{1} \text{ W}$$

c.
$$6.1 \times 10^{0} \text{ W}$$

27. A transverse wave has an amplitude of 2.4 m. What is the vertical distance, in metres, between the top of a crest and the bottom of a trough?

28. Which point, shown in the diagram below, is in phase with point C?



a. B

d. F

b. D

e. G

- c. E
- 29. Which of the following statements is NOT true?
 - a. Pulses reflected from a fixed-end are inverted.
 - b. Pulses reflected from a free-end are not inverted.
 - c. When a pulse enters a new medium no inversion occurs.
 - d. When a wave changes mediums, partial reflection occurs.
 - e. The phase of a transmitted wave depends on the change in speed of the wave.
- 30. Which of the following describes a wave's behaviour due to diffraction?
 - a. The amount of diffraction is independent of wavelength.
 - b. Faster waves diffract more than slower waves.
 - c. Larger openings cause more diffraction to occur.
 - d. Shorter wavelengths diffract less than longer wavelengths.
 - e. Higher frequencies diffract more than lower frequencies if their speeds are the same.

31. What will occur when the two pulses, shown below, interfere with each other?

before interference

- a. A node is created, then the pulses will continue to travel on unaffected.
- b. A super crest is created, then the pulses will continue to travel on unaffected.
- c. A node is created, then the pulses bounce off each other and return to their starting points.
- d. The two pulses completely destroy each other and they disappear.
- e. The two pulses join to form a new crest and travel to the left together.
- A standing wave with three loops is generated in a string. If the wavelength is 10 cm, how far apart 32. are the nodes created?

a. 2.5 cm

d. 20 cm

b. 5.0 cm

e. 30 cm

c. 10 cm

What effect does increasing the angle of an inclined plane have on the component of the force 33. related to gravity?

a. The component parallel to the plane increases, and the perpendicular component decreases.

d. Both components decrease.

- b. The component parallel to the plane decreases, and the perpendicular
 - component increases.
- c. Both components increase.
- e. Both components remain the same, regardless of the angle.
- 34. On which of the following is pitch most dependent?

a. intensity

d. frequency

b. amplitude

e, all of the above

c. loudness

One sound source has an intensity of 40 dB, while another has an intensity of 70 dB. The intensity 35. of these two differs by a factor of

a. 3

d. 2800

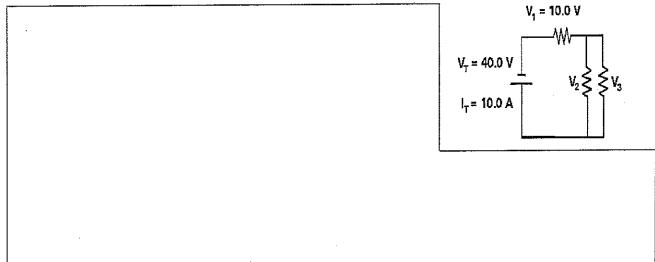
b. 30

e. 10^{30}

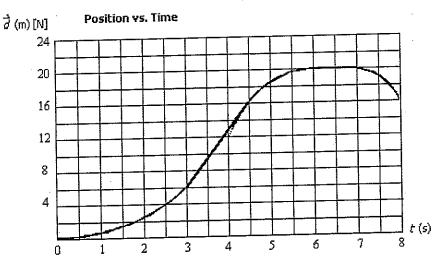
c. 1000

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

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The distance be	ween two succe	essive crests in	a wave is 1.	m, and the so	ource generate	es 25 crest
and 25 troughs i	n 5.0 s. What is	the speed of the	he waves? [4	marks]		
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Assuming that a	I resistors are id	lentical, calcul	late the value	of I_3 (the curre	ent passing the	$\operatorname{rough} V_3$) i
				sistor correspo		



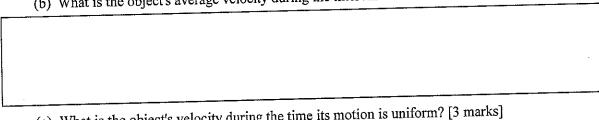
43. Study the position-time graph pictured below and answer the questions that follow.



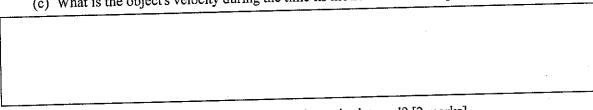
(a) From the graph, what is the object's final displacement? [Hint: direction of motion is towards

	North] [1 mark]			
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(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. ha) 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]