SPH4C Exam Review
Part 1: Definitions and Concepts

Match each of the following quantities on the left to its definition on the right:

____ acceleration	A. The quantity of matter in an object
____ charge	B. The amount of space an object takes up
____ current	C. The change in position of an object
____ density	D. The rate of change in the position of an object
____ displacement	E. The amount of energy transferred to an object by a force
____ force	F. The turning effect caused by a force
____ mass	G. The magnitude of the force per unit area
____ potential difference	H. The mass per unit volume of a material
____ power	I. The rate of doing work or transforming energy
____ pressure	J. The rate of flow of electric charge
____ resistance	K. The opposition to the flow of charge in a material
____ torque	L. The energy per unit charge
____ velocity	M. A push or pull
____ volume	N. The rate of change in the velocity of an object
____ work	O. A quantity of electricity

Match each of the following quantities on the left to the unit used to measure it on the right:

____ acceleration	A. Ampere (A)
____ charge	B. Coulomb (C)
____ current	C. Cubic metres (m^3)
____ density	D. Joule (J)
____ displacement	E. Kilogram (kg)
____ force	F. Kilograms per cubic metre (kg/m^3)
____ mass	G. Metre (m)
____ potential difference	H. Metres per second (m/s)
____ power	I. Metres per second per second (m/s^2)
____ pressure	J. Newton (N)
____ resistance	K. Newton-metre (N·m)
____ torque	L. Pascal (Pa)
____ velocity	M. Ohm (Ω)
____ volume	N. Volt (V)
____ work	O. Watt (W)

Weight is measured using which of the following units?

A. kg B. N C. J D. Both A and B

Kinetic energy is measured using which of the following units?

A. kg B. N C. J D. W

What are the units of efficiency? Explain why.

Motion

What is the difference between a scalar and a vector? Give an example of each:

What is your displacement if you walk 24 m east and then 15 m west?

A. 9 m east B. 9 m west C. 39 m east D. 39 m west

The slope of a position-time graph measures which of the following quantities?

A. acceleration B. displacement C. velocity D. none of the above

Which of the following situations most accurately demonstrates an object moving with constant velocity?

A. a bungee jumper
B. a sailboat in a steady wind
C. the Moon orbiting the Earth
D. both B and C

What is the average speed of a vehicle that takes 0.5 h to travel 30 km?

A. 15 km/h B. 60 km/h C. 150 km/h D. It cannot be determined.

Ms. Rosebery is driving at 20 m/s [N] when she hits the brakes and comes to a complete stop in 10 s. Her acceleration while she is braking is:

A. 0 B. 2 m/s^2 [N] C. 2 m/s^2 [S] D. It cannot be determined.

An object with an initial velocity of 4.0 m/s [N] is accelerated at 2.0 m/s^2 [S] for 2.0 s. What is the final velocity of the object?

A. 4.0 m/s [S] B. 8.0 m/s [N] C. 8.0 m/s [S] D. zero

A ball is dropped from some height. Neglecting air resistance, while the ball is falling, the magnitude of its velocity increases and the magnitude of its acceleration _____.

A. increases
B. decreases
C. is zero
D. is a non-zero constant

Forces

Match each term on the left with the most appropriate description on the right.

____ applied force	A. force exerted on an object by an attached rope or string
____ drag	B. gravitational force on an object
____ friction	C. force that acts opposite to motion or attempted motion
____ normal force	D. perpendicular force exerted by a surface
____ tension	E. force that opposes the motion of an object through a fluid
____ weight	F. force that results when one object contacts another

Which object has the least inertia?

A. a feather B. a pen C. a textbook D. a desk

A 5.0 kg object has an net force of 30.0 N acting on it. What is the acceleration of the object?

A. 6 m/s^2 B. 30 m/s^2 C. 150 m/s^2 D. It cannot be determined.

A book is resting on a table. The Earth is exerting a gravitational force of 8 N [down] on the book. Which of the following is the reaction force?

A. 8 N [up] the table exerts on the book B. 8 N [down] the book exerts on the table
C. 8 N [up] the book exerts on the Earth D. There is no reaction force.

What is the weight of a rock of mass 1.5 kg?

A. 0.15 N B. 6.5 N C. 9.8 N D. 15 N

Which of Newton's Laws explains why you feel as if you are being pushed back in the seat when the vehicle in which you are riding suddenly accelerates forward?

A. Newton's 1^{st} B. Newton's 2^{nd} C. Newton's 3^{rd} D. none of the above

Fuzzy dice are hanging from the rear-view mirror of a car that is travelling backward at constant speed. The dice are:

A. angled toward the back of the car B. angled toward the front of the car
C. hanging straight down D. It cannot be determined.

A box is being pushed across a surface with a constant velocity of 3.0 m/s [W]. What is the direction of the frictional force?

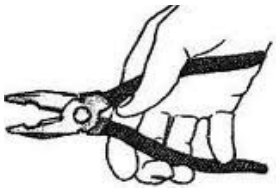
A. West B. East C. up D. down

Simple Machines

A machine may change the _____ of a force.

A. direction B. magnitude C. both A and B D. Neither A nor B

Pliers are made up of two attached _____.



A. inclined planes B. levers C. screws D. wedges

Stairs are considered to be a member of which family of simple machines?

A. inclined plane B. lever C. both A and B D. neither A nor B

If it takes a force of 10 N to pull a 20 N weight up an inclined plane, the AMA was:

A. 0.5 B. 1 C. 2 D. It cannot be determined.

Which will be larger: actual mechanical advantage (AMA) or ideal mechanical advantage (IMA)?

A. AMA B. IMA B. They are equal. D. It cannot be determined.

Torque on a lever will increase when the force is applied _____ the fulcrum.

A. closer to B. further from C. either A or B D. neither A nor B

When the effort torque is equal to the load torque, the lever is in _____ equilibrium.

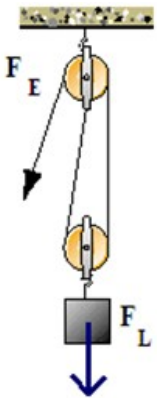
A. constant B. inertial C. static D. all of the above

A wheelbarrow is an example of a _____ class lever.

A. 1st B. 2nd C. 3rd D. It is not a lever.

Which class of lever will always have an IMA of less than 1?

A. 1st B. 2nd C. 3rd D. all of them



What is the ideal mechanical advantage of the pulley system at right?

A. 0 B. 1 C. 2 D. 3

If a small gear is used to turn a large gear, the _____ will increase.

A. speed B. torque C. both A and B D. neither A nor B

Energy

The work done on a system is equal to its change in:

A. force B. energy C. power D. both B and C

Energy may be measured in:

A. Joules B. calories C. kilowatt-hours D. all of the above

1 Joule is equivalent to:

A. $1\frac{m}{s^2}$ B. $1\frac{kg \cdot m}{s^2}$ C. $1\frac{kg \cdot m}{s}$ D. $1\frac{kg \cdot m^2}{s^2}$

A girl lifts a book at constant velocity. Which of the following is increased? The book's:

A. gravitational potential energy B. kinetic energy
C. both A and B D. neither A nor B

The 4-kg book is lifted 1 m in 2 s. What was the power output?

A. 0 W B. 20 W C. 40W D. 80 W

What work is required to accelerate a 2-kg toy car from a speed of 1 m/s to a speed of 2 m/s?

A. 1 J B. 3 J C. 4 J D. It cannot be determined.

An object with a kinetic energy of 40 J is brought to rest by friction. The work done by friction was:

A. -40 J B. 0 J C. 40 J D. It cannot be determined.

A machine uses 480 J of chemical energy to do 120 J of work. The efficiency of the machine is:

A. 4% B. 25% C. 120% D. 400%

The 360 J of energy lost in the previous question was probably lost as _____ energy.

A. elastic potential B. gravitational potential
C. heat D. kinetic

A projectile is launched from ground level. At the highest point in its trajectory its total mechanical energy is _____ its total mechanical energy at its launch position.

A. less than B. equal to C. greater than D. It cannot be determined.

Electricity and Magnetism

The electrons in a DC circuit will flow:

A. from the positive terminal to the negative terminal
B. from the negative terminal to the positive terminal
C. alternately A and B
D. It cannot be determined.

If the resistance of a circuit is increased, the current through the circuit will:

A. increase B. decrease C. remain the same D. It cannot be determined.

Two 4 Ω resistors are placed in parallel. Their equivalent resistance is:

A. 2 Ω B. 4 Ω C. 8 Ω D. 16 Ω

If the voltage supplied to a circuit is increased, the current through the circuit will:

A. increase B. decrease C. remain the same D. It cannot be determined.

If the voltage supplied to a circuit is increased, the power consumed by the load will:

A. increase B. decrease C. remain the same D. It cannot be determined.

A bar magnet is moved inside a conducting coil and locked into place. Current will flow when:

A. the magnet is moved into the coil B. the magnet is locked into place
C. both A and B D. neither A nor B

A generator is a device that:

A. turns mechanical energy into electrical energy
B. turns electrical energy into mechanical energy
C. alternately A and B
D. neither A nor B

A transformer requires:

A. AC B. DC C both AC and DC D. neither AC nor DC

The part of a DC motor that rotates due to magnetic forces is called the:

A. armature B. brush C. commutator D. field magnet

Fluids

The order of substances from maximum to minimum compressibility is:

A. air, water, steel
B. steel, water, air
C. water, air, steel
D. air, steel, water

Pneumatic systems will have a _____ response time compared to that of hydraulic systems.

A. faster B. slower C. similar

When you shift from standing on two feet to standing on one foot:

A. the normal force increases and pressure remains the same
B. the normal force decreases and pressure remains the same
C. the normal force remains the same and pressure increases
D. the normal force remains the same and pressure decreases

A barometer is a device used to measure _____ pressure.

A. absolute B. atmospheric C. gauge D. all of the above

If the height of a column of fluid is increased, it will exert _____ pressure.

A. more B. less C. the same

In a hydraulic system with two pistons, piston A is half the diameter of piston B.
The pressure on piston A is _____ the pressure on piston B.

A. 1/4 B. 1/2 C. 2 times D. 4 times E. the same as

In the previous question, the force on piston A is _____ the force on piston B.

A. 1/4 B. 1/2 C. 2 times D. 4 times E. the same as

Which of the following fluids would have the lowest viscosity?

A. water B. syrup C. hand soap D. The viscosities are the same.

Flow in which the particles of the fluid move smoothly over each other is called _____ flow.

A. eddy B. laminar C. turbulent D. viscous

If the speed of a fluid is increased, the pressure is:

A. increased B. decreased C. unchanged D. It cannot be determined.