

Unit Test Review

Grade 8

Unit 4 – Mechanical Systems

Complete each of the following questions, relating to the specific learner outcomes, covered this year in Grade 8. The questions in this review reflect what you should have mastered and will be tested on in the **Final Achievement Exam**. The answers will be covered in class.

Part 1 – Simple Machines

Describe different simple machines.

A mechanical device that changes the direction or magnitude of force yielding a mechanical advantage.

Examples: inclined plane, lever, wedge, screw, pulley, wheel and axle

Explain how simple machines help people perform tasks easier.

Simple machines lessen the effort force required to perform a task.

Identify the 3 different classes of levers. (p. 271)

Class 1	Class 2	Class 3
Fulcrum is between effort and load	Load is between fulcrum & effort	Effort is between fulcrum & load.
Examples	Examples	Examples
Scissors	Wheelbarrow	Hockey Stick

What is **work**? (p. 276)

Work occurs when a force is exerted on an object resulting in the object travelling a distance

How is work **calculated**? (p. 276)

$W = F \times d$	W - Work (J) F - Force (N) d - distance (m)
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Explain why machines make '**work**' easier.

They change the size or direction of the force exerted on the machine.

Part 2 - Mechanical Advantage

What is **mechanical advantage**? (p. 278)

It is the comparison of the force produced by a machine to the force applied to the machine.

How is mechanical advantage **calculated**?

$MA = \frac{F_L}{F_E}$	MA - Mechanical Advantage F_L - Load Force F_E - Effort Force
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How can machines be **adapted** to suit specific needs? (p.283)

They can be designed by considering body weight, height, size, age, gender etc.

What is **ergonomics**? (p.283)

The Science of designing machines to suit people.

Part 3 - Pulleys

Describe the different types of pulleys and give examples of each.

fixed pulley - attached to something that doesn't move. (pulley at the top of a flagpole) moveable pulley - attached to a rope that goes around the pulley. (elevator) block and tackle - combination of fixed and moveable (oil pump) compound pulley - several pulleys

What is a winch and how does it work?

a small cylinder and a crank/handle. The handle is the effort arm, as you turn it is like you are using a lever over and over again.

What is a wheel and axle and how does it work?

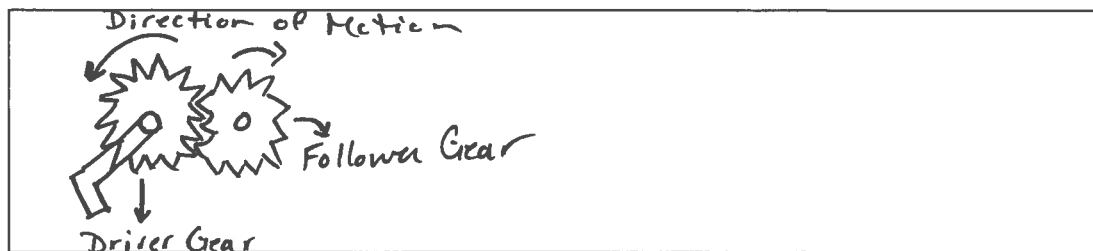
Two turning objects are attached at their centres. Turning one part causes the other to rotate.

What are gears and how do they work?

A gear is a wheel with "teeth". The gear will rotate around its centre.

What is a gear train? (Illustrate an example)

A group of two or more gears whose "teeth" fit together. Turning one causes the second, third etc to turn in the opposite direction.



Illustrate different types of gears.

Driver gear	Follower gear
⇒ Turns because it is attached to a handle or motor. (1 st in train)	⇒ Turns in the opposite direction to the gear "in front" of it. (2 nd , 3 rd etc in train)
Multiplying gears	Reducing gear
Increases rotational speed Driver gear is larger, (more teeth), than follower	Decreases rotational speed Driver gear is smaller, (less teeth) than follower
Wheel and pinion	Chain and sprockets
Two or more gears in contact. They turn in opposite directions.	Two gears connected by links of a chain. They turn in the same direction.

Part 4 – Energy Transformation and Transmission in Machines

Describe the difference between potential and kinetic energy.

Potential energy is stored energy and kinetic energy is the energy of motion.

How is energy transformed in a machine?

Energy is converted from one form to another.
E.g. Kinetic Energy → Thermal Energy

How is energy transferred in a machine?

Energy is transmitted/carried from one place to another. Electrical Energy: Power Plant transmits it to your house.

How do frictional forces affect the operation and efficiency of a machine?

Friction decreases the efficiency of a machine by reducing the amount of energy that can be transferred into the useable form.

What is 'waste energy'? (p.36)

Energy lost as heat (friction), sound etc.

Part 5 - Pressure

What is pressure? (p. 40)

The force acting over a certain area.

How is pressure calculated?

Dividing Force applied by area in contact.

$P = \frac{F}{A}$	<p>p - pressure (kPa) F - Force (N) A - Area (m²)</p>
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What devices use the pressure principle? (p. 48-49)

Air Bags, Boxing Gloves, Helmet, Thumbtack.

What is Pascal's Law?

Pressure is transmitted unchanged in all directions throughout a contained fluid.

What happens when a fluid is compressed?

liquid - the volume will not change
gas - the volume will decrease.

What are hydraulic systems?

a system that utilizes the force of a liquid in a confined space.

What devices use hydraulic systems? (Explain how)

Jaws of life
automobile brakes
boom of a crane
pump

What are pneumatic systems?

air under high pressure is allowed to escape out of the device. (The high pressure is utilized)

What devices use pneumatic systems? (Explain how)

Dentists Drill
Nail Gun
Air Compressor
Jack Hammer

What is a subsystem?

When a simple machine, (inclined plane, lever, wedge, screw, pulley, wheel and axle), are part of a large system.

