

# GRADE 9 SCIENCE REVIEW

You are not allowed your notes, a memory aid, and formulas will NOT be written on the board so study!

## Chapter 1 - Organisation of matter

1. Find the density of a mysterious liquid with a mass of 4.5 grams and a volume of 16 mL.

$$\rho = ?$$

$$\rho = \frac{m}{V}$$

$$m = 4.5 \text{ g}$$

$$\rho = \frac{4.5}{16}$$

$$V = 16 \text{ mL}$$

$$\rho = 0.28 \text{ g/mL}$$

2. Find the mass of an unknown substance with a density of 7.8 g/mL and a volume of 24 mL.

$$\rho = 7.8 \text{ g/mL}$$

$$\rho = \frac{m}{V} \rightarrow m = \rho * V$$

$$m = ?$$

$$m = 7.8 * 24$$

$$V = 24 \text{ mL}$$

$$m = 187.2 \text{ g}$$

3. When a solid is placed in 105 mL of water in a graduated cylinder, the water level rises to 118 mL. If the density of this solid is 2.6 g/mL, what is the mass?

$$\rho = 2.6 \text{ g/mL}$$

$$\rho = \frac{m}{V} \rightarrow m = \rho * V$$

$$m = ?$$

$$m = 2.6 * 13$$

$$V = (118 - 105 \text{ mL}) \rightarrow 13 \text{ mL} \quad m = 33.8 \text{ g}$$

4. What is the volume of an item that has a density of 5.42 g/mL and a mass of 16.802 g?

$$\rho = 5.42 \text{ g/mL}$$

$$\rho = \frac{m}{V} \rightarrow V = \frac{m}{\rho}$$

$$m = 16.802 \text{ g}$$

$$V = \frac{16.802}{5.42}$$

$$V = ?$$

$$V = 3.1 \text{ mL}$$

5. Convert the following:

$$4500 \text{ mL} = 4.5 \text{ L} \quad 0.65 \text{ L} = 650 \text{ mL} \quad 2.45 \text{ g} = 2450 \text{ mg}$$

6. What are the three phases that matter generally assumes?

Solid, Liquid, Gas

6. Describe the movement and structure of particles in a solid, a liquid and a gas.

In a solid, there is very little movement, packed very close together.

In a liquid, there is more movements than solids, packed close together.

In a gas, there is lots of movement, spread far apart

7. What is the difference between a mixture and a pure substance?

A pure substance has only one kind of atom or molecule.

A mixture has a number of different pure substances mixed together.

8. What are the 2 types of mixtures? Give 2 examples of each.

Homogeneous  $\rightarrow$  gold ring, apple juice, air, vinegar

Heterogeneous  $\rightarrow$  vegetable soup, rock, smog, pizza

9. What are the 2 types of pure substances? Give an example of each.

Element  $\rightarrow$  Copper, Silver, Iron

Compound  $\rightarrow$  Water, Salt, Carbon dioxide

10. What is the mass of solute dissolved in 3200 mL of a 2 g/L solution?

$$C = 2 \text{ g/L} \qquad C = \frac{m}{V} \quad \rightarrow \quad m = C * V$$

$$m = ? \qquad m = 2 * 3.2$$

$$V = 3200 \text{ mL} \rightarrow 3.2 \text{ L} \qquad m = 6.4 \text{ g}$$

11. In a lab, 41 g of solute is placed in 250 mL of solvent to create a solution. What is the concentration of this solution?

$$C = ? \qquad C = \frac{m}{V}$$

$$m = 41 \text{ g} \qquad C = \frac{41}{0.25}$$

$$V = 250 \text{ mL} \rightarrow 0.25 \text{ L} \qquad C = 164 \text{ g/L}$$

12. You have 65.3 g of solute and want to make a solution that is 20 g/L. What is the volume of water needed to make this solution?

$$C = 20 \text{ g/L} \qquad C = \frac{m}{V} \quad \rightarrow \quad V = \frac{m}{C}$$

$$m = 65.3 \text{ g} \qquad V = \frac{65.3}{20}$$

$$V = ? \qquad V = 3.27 \text{ L}$$

13. A solution has a concentration of 8 g/L and a volume of 7 L. If the concentration of the solution is reduced by half (so the new concentration is 4 g/L), what will happen to the volume of the new solution?

$$C_1 = 8 \text{ g/L} \qquad C_1 * V_1 = C_2 * V_2$$

$$V_1 = 7 \text{ L} \qquad 8 * 7 = 4 * V_2$$

$$C_2 = 4 \text{ g/L} \qquad \frac{56}{4} = \frac{4 * V_2}{4}$$

$$V_2 = ? \qquad V_2 = 14 \text{ L}$$

(Or because the concentration was reduced by half, the volume will be doubled and is therefore 14 L).

14. A solution is made by adding 3 g of chocolate powder to 150 mL of milk. What is the concentration percent of this new solution (chocolate milk)?

$$M = 3 \text{ g} \qquad \frac{3 \text{ g}}{150 \text{ mL}} = \frac{?\%}{100 \text{ mL}}$$

$$V = 150 \text{ mL} \qquad 100 \text{ mL} * 3 \text{ g} \div 150 \text{ mL} = \%$$

$$C_{\%} = ? \qquad C_{\%} = 2\%$$

15. Check off what type of mixture or pure substance each of the following is.

	Mixtures		Pure Substances	
	Homogeneous	Heterogeneous	Element	Compound
Chocolate Chip Cookie		✓		
Chicken Noodle Soup		✓		
Iron (Fe)			✓	
Blood	✓			
Carbon Dioxide (CO <sub>2</sub> )				✓
Chocolate Milk	✓			
Water (H <sub>2</sub> O)				✓
Urine	✓			

Gold (Au)				
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## Chapter 2 - Energy

- Explain the difference between an energy transformation and energy transfer.  
**Energy transfer** is the movement of energy from one object to another without changing its form. For example, electrical energy from a power station to electrical energy to your home.  
**Energy transformation** is the movement of energy from one object to another that changes forms. For example, a toaster transforms electrical energy into thermal energy.
- Define the three types of physical changes listed below:
  - Phase Change (or Change of State): **changes from 1 state to another (solid → liquid)**
  - Dissolution: **dissolving a solute in a solvent (salt water)**
  - Deformation: **changing the shape of the material**
- Give the definition of the following chemical changes:
  - Synthesis: **forming a complex molecule from simple molecule (putting together)**
  - Decomposition: **breaking down complex molecules into simple ones**
  - Oxidation: **chemical reaction involving oxygen**
  - Precipitation: **forming a solid when 2 solutions are mixed**
- Energy that comes from the movement of particles is what type of energy?
  - Solar Energy
  - \* Thermal Energy**
  - Sound Energy
  - Hydraulic Energy
- What is decomposition?
  - \*The transformation of complex molecules into simpler ones**
  - A chemical reaction involving oxygen
  - A physical change that changes the shape of a material
  - None of the above
- Energy that is contained in and transported by electromagnetic waves is called:
  - \*Radiant Energy**
  - Thermal Energy
  - Elastic Energy
  - Wind Energy
- State whether the following are examples of energy transformation or energy transfer:
  - A lamp's electrical energy changes into radiant energy: **Transformation**
  - Electricity travels along wires from a power plant to homes: **Transfer**
  - Eating an apple and then dancing around: **Transformation**
  - Heat moving around our homes: **Transfer**
  - Turning on the TV in a dark room, and the TV lights up the room: **Transfer**

## Chapter 3 - Fluids & Pressure

- What is the difference between an incompressible fluid and a compressible fluid? Provide an example of each.  
**A compressible fluid, the volume can change. Gases are compressible fluids.**  
**In an incompressible fluid, the volume does not change. Liquids are incompressible fluids.**

2. A mother and child are walking through deep snow. Who will sink deeper in the snow and why?
- \*The mother will sink deeper in the snow because she has a greater mass, and exerts a greater pressure.
  - The mother will sink deeper in the snow because she has a greater mass, and exerts a lower pressure.
  - They will both sink to the same level because mass doesn't affect pressure.

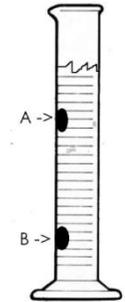
3. Which of the following is NOT a fluid?

- Milk
- Blood
- Oxygen
- \*Kleenex

4. A test tube is filled with a solution. There are two holes in the test tube marked by A and B.

Which of the following statements is true concerning the pressure of these two holes?

- The liquid coming out of A will spurt out farther because there's more pressure at the top.
- \*The liquid coming out of B will spurt out farther because there's more pressure at the bottom.
- The liquid coming out of B will spurt out farther because there's less pressure at the bottom.
- The liquid will spurt out of both spots equally as the pressure is the same throughout the graduated cylinder.



5. When we inhale, our lungs fill with air and the volume of air in our lungs increase. During inhalation, what happens to the pressure in our lungs?

As volume increases the pressure decreases

#### Chapter 4 – Waves (The Perception of Light and Sound)

1. What do waves carry?

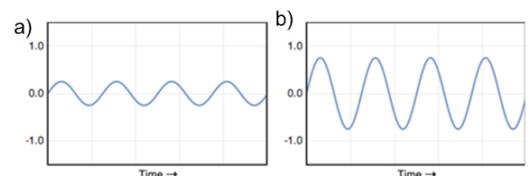
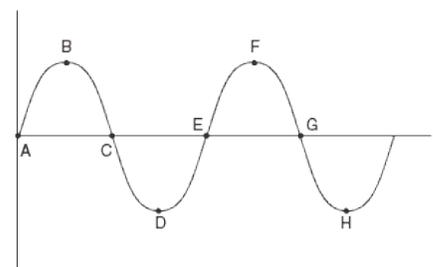
- Matter
- \*Energy
- Matter & Energy
- Fluids

2. Karen has noticed that she has difficulty seeing things close up, they become all blurry. Which of the following is true?

- Karen might have myopia and a diverging lens could correct it.
- Karen might have myopia and a converging lens could correct it.
- Karen might have hyperopia and a diverging lens could correct it.
- \*Karen might have hyperopia a converging lens could correct it.

3. In the wave to the right, indicate the following:

- A wavelength (highlight a full wavelength) B→F, or A→E, or C→G, or D→H
- The crest B & F
- The trough D & H



4. Which of the following has higher amplitude? B

## Chapter 5 – Cellular Specialization and Reproduction

1. What is the relationship between cells, tissues, organs and systems?  
Cells → Tissues → Organs → Systems (**smallest to largest**)
2. Give the three main reasons as to why cell division occurs.  
**Growth, Repair & Sexual reproduction**
3. Describe mitosis (with at least three characteristics)
  - **1 cell makes 4 non-identical daughter cells**
  - **Start with 46 chromosomes end with 23 chromosomes**
  - **For sexual reproduction**
4. Describe meiosis (with at least three characteristics)
  - **1 cell makes 2 identical cells**
  - **Start with 46 chromosomes end with the same amount**
  - **For growth and repair**
5. How many chromosomes does a diploid cell have?  
**46**
6. How many chromosomes does a haploid cell have?  
**23**
7. What is DNA? What is a gene? What is a genome?  
**DNA: Located in the cell's nucleus, shaped like a double helix**  
**Gene: Segment of DNA**  
**Genome: Complete set of genetic information**
8. What is genetic diversity?  
**Genetic diversity** refers to the variety of genes within a species.

## Reproductive System

1. What is puberty?  
**The changes that prepare the body to be able to reproduce**
2. What are hormones?  
**Chemical messengers that are transported by the blood**
3. Which hormones trigger puberty?  
**FSH & LH**
4. What are the female sex hormones? The male sex hormones?  
**Female: progesterone & estrogen**  
**Male: testosterone**
5. What is oogenesis?  
**Process of ovum production in the female through meiosis.**
6. What hormones cause the menstrual cycle to start?  
**A decrease in progesterone causes the start of the menstrual cycle**
7. Where is a female ovum fertilized?  
**In the fallopian tube**
8. What is spermatogenesis?  
**Process of sperm production in the male through meiosis.**

## Chapter 6 – Nutrition, Respiration, Blood, Cardiovascular and Lymphatic System

1. Which nutrient is the body's main source of energy?  
Carbohydrates
2. What are the 6 nutrients? Give an example of a food rich in each nutrient.  
Carbohydrates: bread, spaghetti  
Proteins: steak, eggs  
Fats: dairy  
Vitamins: fruits  
Minerals: vegetables  
Water: soups
3. Where proteins are first digested? Carbohydrates? Fats?  
Proteins: stomach  
Carbohydrates: mouth  
Fats: small intestines
4. Give 2 examples of mechanical transformations that occur during the digestion process.  
Chewing & Churning
5. In which organ are all nutrients absorbed?  
Small intestines
6. Where does the absorption of water take place?  
Large intestines
7. What is the name of the muscle contraction that moved food down the esophagus to the stomach?  
Peristalsis
8. Which digestive gland targets the breakdown of fats?  
Liver
9. Give 2 examples of chemical transformations that occur during the digestion process.  
Saliva in the mouth & intestinal glands
10. What is important about the location of the first item on an ingredient list?  
It is the main ingredient

### Respiration

1. What are the 6 main parts of the respiratory system?  
Nasal cavity, pharynx, larynx, trachea, bronchi, & lungs
2. What is the main goal of respiration?  
Extract oxygen from the air and to expel carbon dioxide
3. What happens during inhalation?  
Lung volume increases, air pressure inside the lungs decreases, oxygen rich air flows in & diaphragm contracts
4. What happens during exhalation?  
Lung volume decreases, air pressure inside the lungs increases, carbon dioxide rich air flows out & diaphragm relaxes
5. How does gas exchange occur in the lungs? Where exactly does this happen?  
Gas exchange occurs by diffusion and it happens in the alveoli.

6. What is the name of the small blood vessels that carry the oxygenated blood away from the lungs?  
**Pulmonary veins**

### **Blood compatibility**

1. What are the 4 constituents of blood?  
**Plasma, white blood cells, red blood cells & platelets**
2. Which blood type is known as the universal donor? Why?  
**O-, this blood type does not carry any substances to harm any other type**
3. Which blood type is known as the universal recipient? Why?  
**AB+, it has all the substances**
4. Can a person with blood type AB- donate to a person with a blood type of A-? Why or why not?  
**No, you would be giving them substance B**
5. Can a person with blood type B+ donate to a person with a blood type of B-? Why or why not?  
**No, you would be giving them the Rh factor**
6. Which blood types would be able to donate to a person with O+ blood?  
**O+ and O-**
7. Which blood types could donate to a person with A+ blood?  
**A+, A-, O+, O-**

### **Cardiovascular System**

1. What is an artery? What is a vein? What is a capillary?  
**Artery: carries blood away from the heart**  
**Vein: carries blood towards the heart**  
**Capillary: the in between zone of arteries and veins**
2. What is the difference between pulmonary and systemic circulation?  
**Pulmonary: the flow of blood from heart to lungs and back**  
**Systemic: the flow of blood from the heart to the rest of the body and back**
3. What part of the heart is considered the pump?  
**Left ventricle**

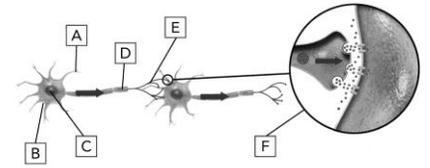
### **Lymphatic System**

1. What is extracellular fluid? Lymph?  
**All bodily fluids outside of cells**
2. What is phagocytosis?  
**Process by which certain living cells called phagocytes ingest or engulf other cells or particles.**
3. How do antibodies and antigens protect our bodies?  
**When an antigen enters the body, the immune system produces antibodies against it.**
4. Which of the following protects the body from infection?
  - a) Red blood cells
  - b) Platelets
  - c) **\*White blood cells**
  - d) Lymph

## Chapter 7 – Nervous system, Senses, Musculoskeletal System

1. In the diagram of a neuron (located to the right), which letter represents the location of an axon?

- a) A
- b) C
- c) \*D
- d) E



2. What is a nerve impulse?

- a) A receptor
- b) The transition zone between two neurons
- c) The centre of balance and movement coordination
- d) \*An electrical signal transmitted by a neuron

3. Which muscle below is correctly classified?

- a) Biceps – cardiac muscle
- b) Heart – skeletal muscle
- c) \*Small intestines – smooth muscle
- d) Bladder - skeletal muscle

4. Which of the following is not a function of the musculoskeletal system?

- a) \*Helping to maintain body temperature
- b) Protecting soft organs
- c) Production of red blood cells
- d) Fighting infection

5. In what order does light travel through the eye?

- a) \*The pupil, the lens, the vitreous humour, and the retina
- b) The lens, the pupil, the vitreous humour, and the retina
- c) The retina, the lens, and the pupil
- d) The iris, the lens, the cornea and the optic nerve

6. Which part of the eye detects colour:

- a) Cones
- b) Iris
- c) Pupil
- d) Rods

7. Which part of the brain is the center for balance and movement? Name something that is not controlled by the cerebrum?

The cerebellum.  
Involuntary movement is not controlled by the cerebrum

8. What is a reflex arc? Describe one in detail.

The nerve pathway involved in a reflex action.

9. Fill in the following table using the words below:

Sense	Organ	Receptors	Location of Receptors	Example of Stimuli
Hearing	Ear	Nerve cells	Cochlea	Sound
Vision	Eye	Photoreceptors	Retina	Light
Smell	Nose	Olfactory bulb	Nasal Cavity	Odours
Taste	Tongue	Papillae	Taste buds	Chemicals
Touch	Skin	Sensory nerves	Dermis	Pressure, Temperature

Words to use: Chemicals, Cochlea, Dermis, Ear, Eye, ~~Hearing~~, Light, Nasal Cavity, Nerve Cells, Nose, Odour, Olfactory Bulb, Papillae, Photoreceptors, Pressure, Retina, Sensory, Skin, ~~Smell~~, Sound Waves, Taste Buds, ~~Taste~~, Temperature, Texture, Tongue, ~~Touch~~, ~~Vision~~

### Chapter 8 – Biotechnology

- Which of the following is a definition of pasteurization?
  - \*A process whereby food is heated for a period of time in order to destroy harmful microorganism.
  - The capacity to resist a disease to which we have been exposed by being able to fight off the infectious agent.
  - A prepared substance that is able to immunize an organism against one or several diseases.
  - A medical procedure used to help women become pregnant.

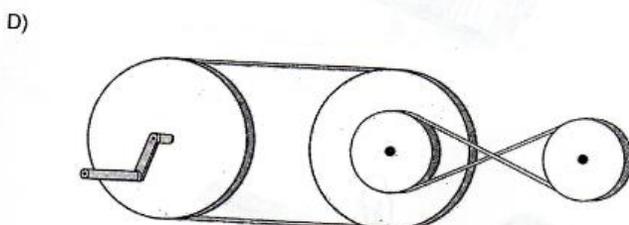
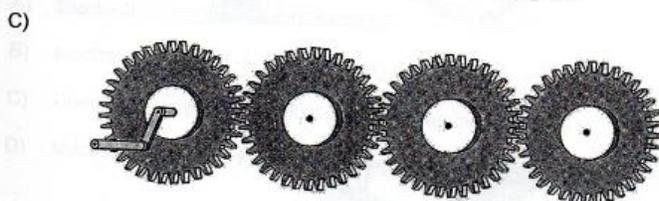
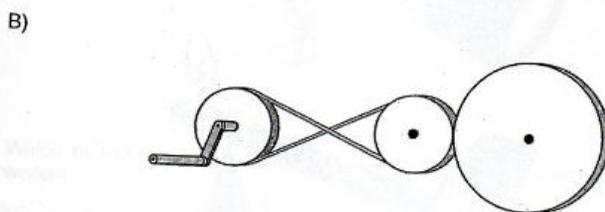
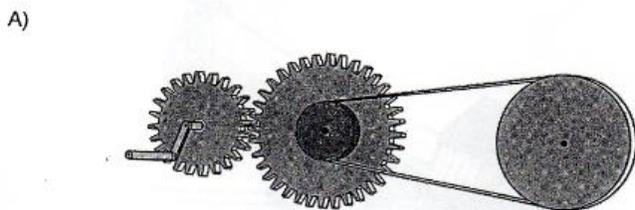
### 2. Why are some foods pasteurized? What are the benefits of pasteurizing foods?

- It provides healthier foods.
- It prolongs the shelf-life of food.
- Preserves the nutritional properties of food.

### Chapter 9 – Earth and Space

### Chapter 10 – Origins of Life

- What conditions are needed for new life to be able to form?
  - Presence of essential chemicals (Carbon, Oxygen, Hydrogen, and Nitrogen)
  - Presence of an Energy Source
  - Presence of Liquid Water
  - A very long period of time



### Chapter 12 and 13 - Technology Review

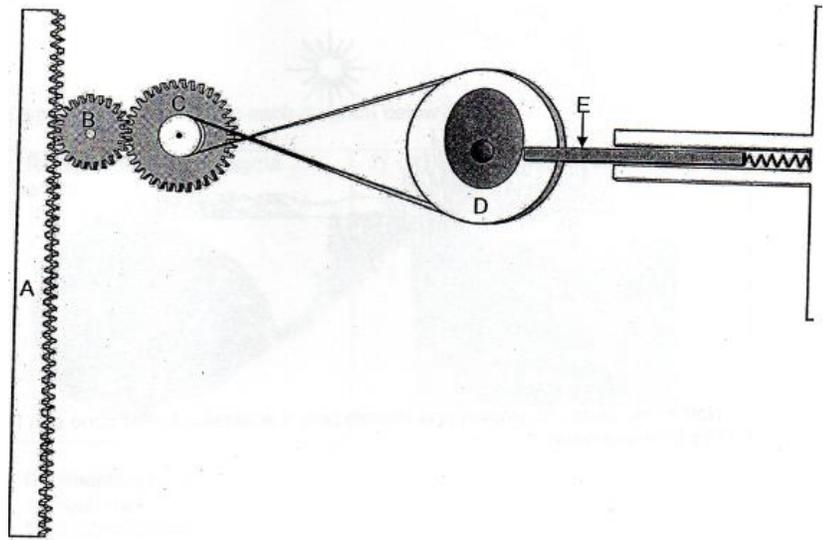
- In which of the following motion transmission chains does the final component (driven component) turn in the same direction as the initial component (driver component)?

**B**

2. The following diagram shows five components (A, B, C, D and E) involved in a series of transformations and transmissions of motion.

Indicate whether the operation of each pair of components listed below involves motion transmission or motion transformation.

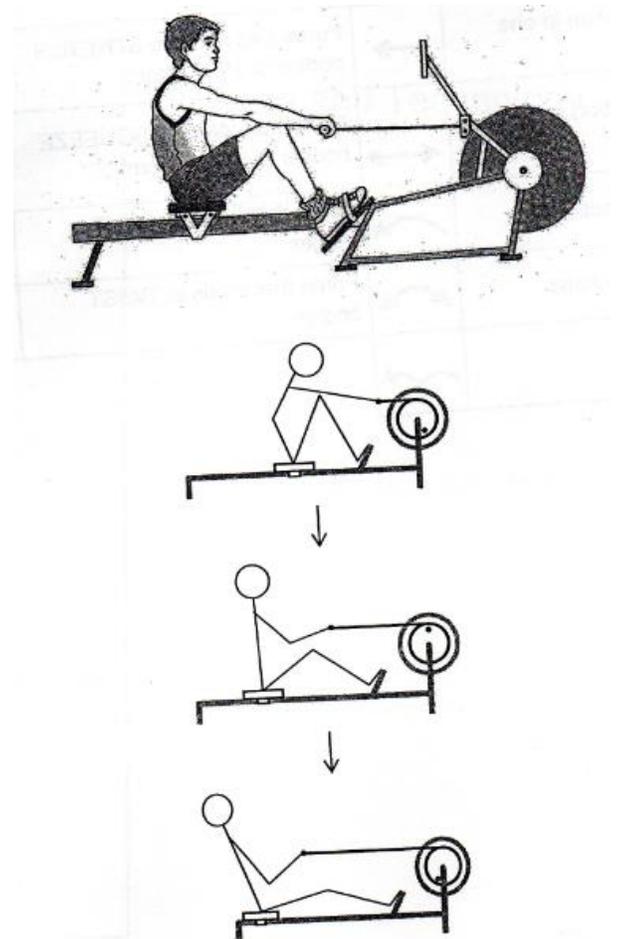
- 1) Components A & B : **Motion Transformation**
- 2) Components B & C: **Motion Transmission**
- 3) Components C & D: **Motion Transmission**
- 4) Components D & E: **Motion Transformation**



3. The diagram below shows how an exercise machine called a rowing machine works. Draw the appropriate symbols of the **two types of motion** and the **two forces** involved in using this machine.

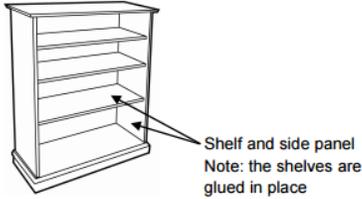
The wheel undergoes rotational motion while the seat undergoes translational motion.

The cord and handle undergo tension (pulling) while the seat undergoes compression.



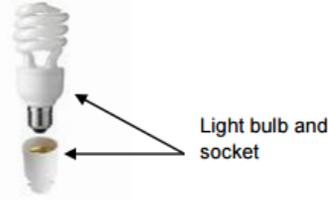
4. List the link characteristics for the following objects:

a) Bookshelf



- Direct or Indirect
- Complete or Partial
- Removable or Permanent
- Rigid or Flexible

b)



- Direct or Indirect
- Complete or Partial
- Removable or Permanent
- Rigid or Flexible

Below are some characteristics of different materials. Use that information to help you answer the questions below.

Copper is malleable, ductile, a good conductor of heat and electricity and resistant to corrosion.

Tin is soft, weak, malleable, ductile and resistant to corrosion.

Aluminum is lightweight, soft, ductile, good conductor of heat and electricity.

Red Cedar Wood is lightweight, durable and a good thermal insulator.

Elm is tough and durable.

5. Which properties of copper make it a good material to make electrical wires with?

It is a good conductor of electricity.

6. Which material from above would be a good choice for creating a ladder?

Elm is tough and durable, and could support a lot of weight. Red Cedar is also durable, but is lightweight so could easily be carried from location to location. Tin is resistant to corrosion and wouldn't rust.

7. State the main type of guiding control for each item to the right:

a) Peanut Butter Jar



Rotational

b) Window



Translational

c) File Cabinet Drawer



Translational

d) Door Handle



Rotational

e) C-clamp



Rotational

f) Laptop



Rotational

8. What type of system is shown on the right?

Belt and Pulley System

9. In the system to the right, would component A or B be moving faster?

Component B because it is smaller.

