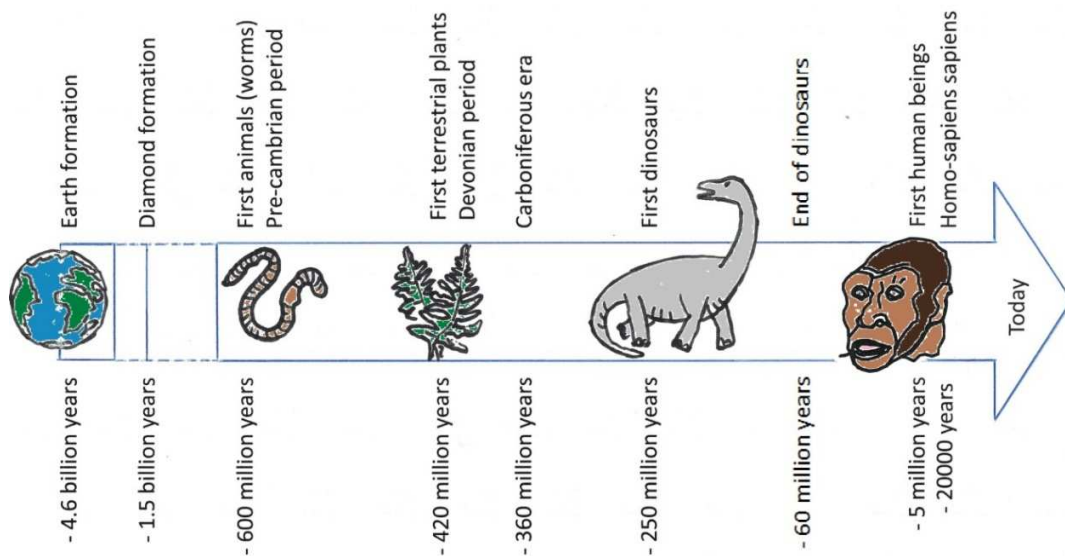


NATURAL AND SYNTHETIC FORMS OF CARBON

Natural forms of carbon	Applications	Synthesized forms of carbon	Applications
Coal	Heating	Charcoal	Barbecue
Lignite	Heating	Coke	Heating, metal extraction
Anthracite	Heating	Activated carbon	Aquarium, deodorizer, medicine
Graphite	Pencil	Carbon fibers	Bicycle, airplane, boat
Diamond	Jewelry, abrasives	Synthetic diamond	Abrasives

GEOLOGICAL TIME SCALE

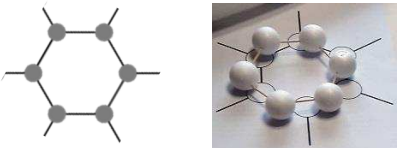
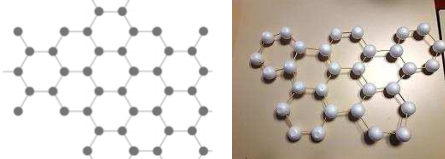
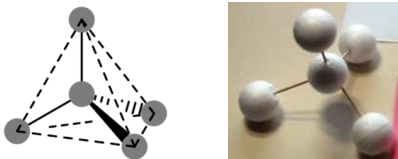
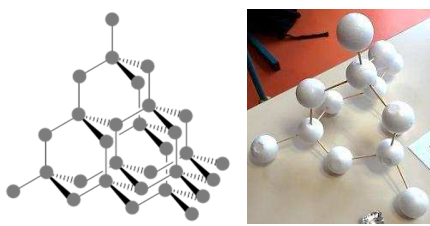
Color the drawing



The age of earth is 4.6 billion years.
 Coal formation started 360 million years ago.
 Coal results from the slow decomposition of plants.
 Diamond formation is *older/younger than coal formation.
 First human being appeared 5 million years ago.

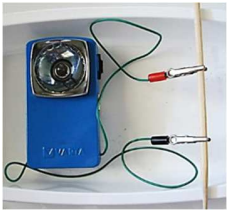

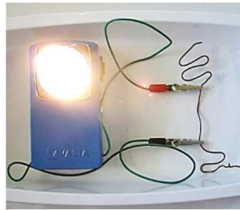
* *Cross out the wrong answer*

COMPOSITION AND PROPERTIES OF GRAPHITE AND DIAMOND

Property	Graphite	Diamond
<p>Organization of carbon atoms</p> <p>Draw or paste pictures</p>	 <p>Carbon atoms form a <u>*hexagon / tetrahedron</u>.</p> <p>Hexagons are connected in a layer forming the graphene structure.</p>  <p>Each carbon atom has <u>3</u> neighbors.</p> <p>Graphite is made of piled graphene layers.</p>	 <p>Carbon atoms form a <u>*hexagon / tetrahedron</u>.</p> <p>Tetrahedrons are connected in the diamond structure.</p>  <p>Each carbon atom has <u>4</u> neighbors.</p>
<p>Hardness</p>	<p>I can write on paper using a pencil, because graphene layers can separate by slipping one over the other and stick to the paper.</p> <p>Graphite is <u>*soft / hard</u>.</p>	<p>I cannot write on paper using diamond because carbon atoms are strongly attached in all directions and cannot separate.</p> <p>Diamond is <u>*soft / hard</u>.</p>
<p>Color</p>	<p>In graphite, carbon atoms use 3 of their 4 electrons to connect strongly to other atoms. The remaining electrons are mobile and form a cloud that absorbs light.</p> <p>Graphite is <u>*black / transparent</u>.</p>	<p>In diamond, carbon atoms use all their 4 electrons to connect strongly to other atoms. No mobile electrons are available. Light goes through diamond without being trapped.</p> <p>Diamond is <u>*black / transparent</u>.</p>
<p>Conductivity</p>	<p>The cloud of mobile electrons can transport electricity.</p> <p>Graphite is <u>*conductive / insulating</u>.</p>	<p>In diamond no electrons are available to conduct electricity.</p> <p>Diamond is <u>*conductive / insulating</u>.</p>



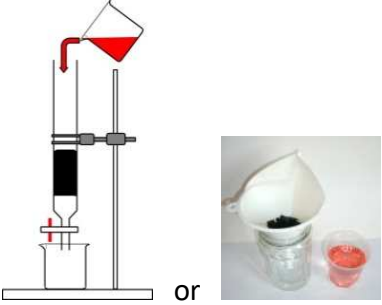

** Cross out the wrong answer*

CONDUCTIVITY OF GRAPHITE: I LIGHT A BULB

Experiment	Wood chopstick	Pencil lead	Copper wire
Connect clips to each material Observe light bulb Draw the circuit	Light is *ON / OFF 	Light is *ON / OFF 	Light is *ON / OFF 
Electrical property	The wood chopstick *conducts / does not conduct electricity. It is *conductive / insulating	The pencil lead *conducts / does not conduct electricity. It is *conductive / insulating	The copper wire *conducts / does not conduct electricity. It is *conductive / insulating The bulb shines *more / less than with the pencil lead.
Explanation	Wood is made of organic matter that does not conduct electricity.	The pencil lead is made of a mixture of conductive graphite powder and clay which is insulating.	Copper is a metal and conducts electricity better than the mixture of graphite and clay.

* Cross out the wrong answer

ADSORPTION PROPERTIES OF ACTIVATED CARBON: I DISCOLOR GRENADINE

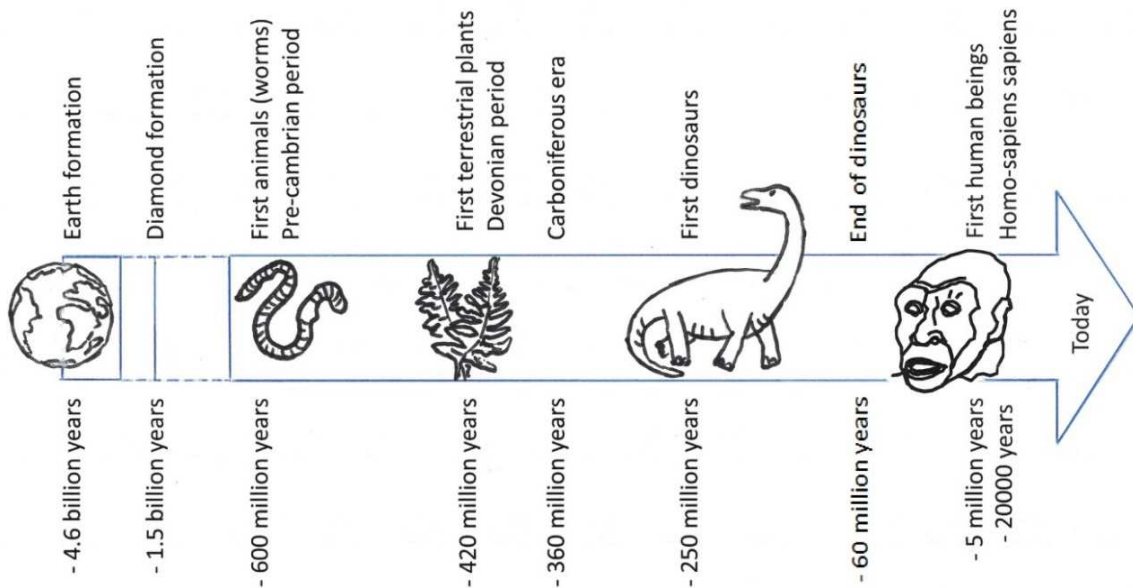
Experiment	Water	Water + grenadine	Water + grenadine passed over activated carbon
<p>Add color where needed</p> <p>Draw equipment</p>			
<p>What is the color of the liquid?</p>	<p>Water is colorless.</p>	<p>When I add grenadine, the liquid is pink.</p>	<p>After passing over activated carbon, the liquid is colorless.</p>
<p>Explanation</p>	<p>The liquid contains only water.</p>	<p>Grenadine is colored because it contains a dye.</p>	<p>The surface of activated carbon resembles an egg box. The dye is trapped in the holes.</p>  <p>Only water goes through. This phenomenon is called adsorption.</p>

NATURAL AND SYNTHETIC FORMS OF CARBON

Natural forms of carbon	Applications	Synthesized forms of carbon	Applications

GEOLOGICAL TIME SCALE

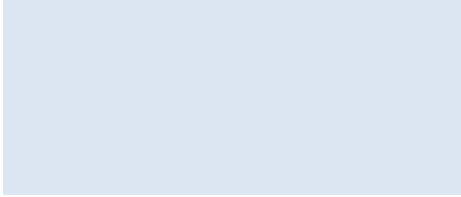
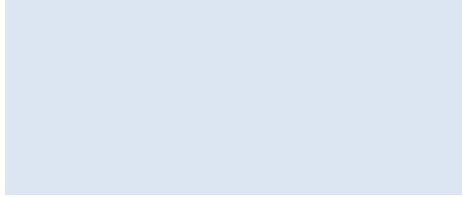
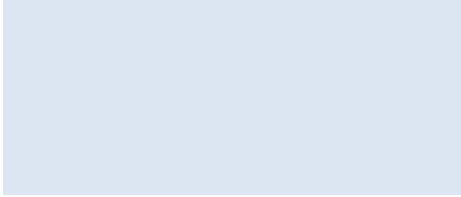
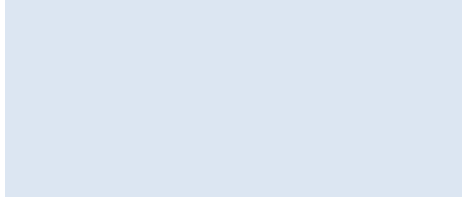
Color the drawing



The age of earth is _____ years.
 Coal formation started _____ years ago.
 Coal results from the slow decomposition of _____.
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 First human being appeared _____ years ago.

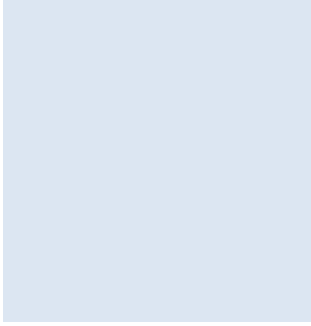
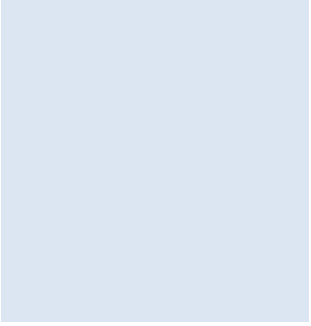
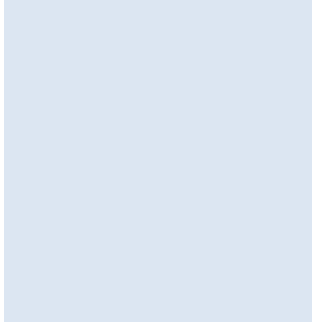
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Property	Graphite	Diamond
Organization of carbon atoms	 <p>Carbon atoms form a <u>*hexagon / tetrahedron</u>. Hexagons are connected in a layer forming the graphene structure.</p>	 <p>Carbon atoms form a <u>*hexagon / tetrahedron</u>. Tetrahedrons are connected in the diamond structure.</p>
Draw or paste pictures	 <p>Each carbon atom has <input type="text"/> neighbors. Graphite is made of piled graphene layers.</p>	 <p>Each carbon atom has <input type="text"/> neighbors.</p>
Hardness	<p>I can write on paper using a pencil, because graphene layers can separate by slipping one over the other and stick to the paper.</p> <p>Graphite is <u>*soft / hard</u>.</p>	<p>I cannot write on paper using diamond because carbon atoms are strongly attached in all directions and cannot separate.</p> <p>Diamond is <u>*soft / hard</u>.</p>
Color	<p>In graphite, carbon atoms use 3 of their 4 electrons to connect strongly to other atoms. The remaining electrons are mobile and form a cloud that absorbs light.</p> <p>Graphite is <u>*black / transparent</u>.</p>	<p>In diamond, carbon atoms use all their 4 electrons to connect strongly to other atoms. No mobile electrons are available. Light goes through diamond without being trapped.</p> <p>Diamond is <u>*black / transparent</u>.</p>
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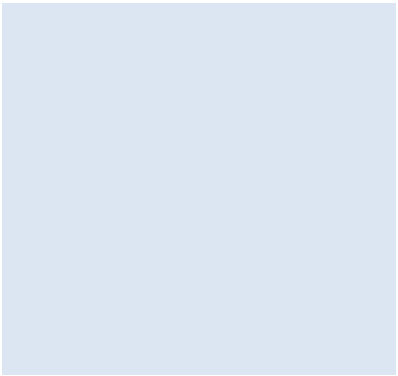

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Experiment	Wood chopstick	Pencil	Copper wire
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Add color where needed Draw equipment			
What is the color of the liquid?	Water is _____.	When I add grenadine, the liquid is _____.	After passing over activated carbon, the liquid is _____.
Explanation	The liquid contains only _____.	Grenadine is colored because it contains a _____.	The surface of activated carbon resembles an egg box. The dye is trapped in the holes.  Only water goes through. This phenomenon is called _____.