



Pre-Reading Activities

A: Sharing Information

1. You are going to read today about diamonds. What do you know about diamonds? Share any information you know in pairs.

2. Your teacher will give you a sentence. Remember the information in this sentence and then teach it to other students. Talk to the other students in your class until you have heard and learnt all the information. (At the end of class today, your teacher may test you on this information so make sure you learn it!)



Reading Activities

A: Comparing Information

Here are some sentences about **Part One** of the article. Which sentences contain information from **Part One** of today's news article below? Tick the column. (You can choose a number of sentences as your answer.)

Sentences	Have information	Don't have information
<ol style="list-style-type: none"> 1. <i>Diamonds may now be used in cars.</i> 2. <i>Diamonds are used as semiconductors.</i> 3. <i>Developments in manufacturing diamonds are increasing the ways in which diamonds can be used.</i> 4. <i>Diamond is becoming as important a material as silicone twenty years ago.</i> 5. <i>Not enough diamonds can be mined to supply demand.</i> 6. <i>Manufactured diamonds will become more popular than mined diamonds as jewelry.</i> 7. <i>Semiconductors may be produced that will be superior to other semiconductors.</i> 8. <i>Electric cars are much cleaner than other kinds of cars.</i> 9. <i>Diamonds are durable even in high temperatures.</i> 10. <i>People may be able to buy electric cars in the future thanks to diamond technology.</i> 		

Part one:

Synthetics drive revolution in diamond technology

BY ALISTAIR THOMSON

DAKAR, Thursday July 14, 2005, (Reuters) - For centuries diamonds have lured women up the aisle; in future they may drive them to work as engineers find a use for the precious stones in electric cars and other applications.

From ultra-durable drill bits to semiconductors and optical instruments, industry officials say the uses for diamonds are multiplying and advances in synthetic production have opened the floodgates to ever more innovative applications.

"Diamond as a material is like what steel was in the 1850s and what silicone was in the 1980s. There will be lots of uses for it in the next 50 years but there is not enough of it in the ground," said Bryant Linares, president and CEO of Massachusetts-based synthetic producer Apollo Diamond.

"We have the potential to make semiconductors which can be faster, and better, than any of the existing available semiconductors," said Linares' father Robert, chairman of the family-controlled business, speaking in a joint call to Reuters.

The durability of diamonds at high temperatures may revolutionize high-performance processors and could help make the electric car a reality for consumers around the world, he said.

"A lot of the problem with electric cars, power grids and even the computers of the future is dealing with the heat. The use of diamond rather than silicone can reduce the amount of circuitry by up to 80 percent," he said. (Continued/...)

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B: Completing A Chart

Part Two of the article describes two ways of manufacturing diamonds. Use **Part Two** to complete the notes in the chart about the two methods.

HPHT - what happens Diamonds are formed when a) _____, HPHT was developed by b) _____ in the mid-20th century.
CVD - what happens Diamonds are formed when c) _____.
Advantages of CVD over HPHT It is easier to make d) _____. <i>Example:</i> Extremely thin diamond layers e) _____. The producer has more control f) _____. <i>Result:</i> Colorless stones can be produced.

Part two:

VAPOR

One of the major advances in synthetic diamond technology is chemical vapor deposition (CVD), which forms diamonds through a chemical reaction between gases.

CVD can be manipulated to make particular shapes of diamond much more effectively than the older "high pressure, high temperature" (HPHT) method developed by General Electric in the mid-20th century which compresses carbon into diamond using molten metal as a catalyst.

That means wafer-thin layers of diamond can be produced for use in microprocessors, or thicker diamonds for other purposes.

The vast majority of diamond used in industrial processes around the world are synthetic. The Diamond Trading Company (DTC), the marketing arm of diamond giant De Beers, says some 200 tons of tiny synthetic diamonds, or grit, are used by industry each year -- several times total mined production.

With HPHT production, relatively few gem quality stones were produced, and most that were of yellow-brown color, sometimes known in the trade as "canaries."

But the CVD process gives the producer more control over the diamond produced and, vitally, can produce colorless stones. (Continued.../)

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C: Matching Names And Definitions

Read **Part Three** of the article on the next page. Match the names with the definitions.

Names

- a. De Beers
- b. Element Six
- c. Stephen Lussier
- d. CVD
- e. Apollo
- f. the majority of women

Information

- 1. a way of manufacturing diamonds.
- 2. says that how much a diamond is worth is based on the fact that the Earth is no longer making diamonds.
- 3. want mined gems.
- 4. a company controlled by De Beers.
- 5. hopes to manufacture diamonds to sell as jewelry.
- 6. believes that synthetic diamonds will not risk its market for mined diamonds.



Part three:

(Continued.../ De Beers, which controls around 55 percent of rough diamond sales by value, is also in the synthetic market through its Element Six subsidiary, the leading producer of synthetic diamonds for industrial use.

De Beers estimates the potential market for industrial diamond applications at \$50 billion -- nearly as much as the \$60 billion worldwide gem diamond jewelry sales and several times the \$16.7 billion worth of diamonds in that jewelry.

In addition to its hi-tech products, Apollo has its eye on the gem market and believes CVD will eventually produce diamonds to compete openly in the market with mined stones.

"They are chemically, physically and optically identical to mined diamonds," said Robert Linares. "(But) we would prefer the fiancée to know she's got an Apollo diamond."

De Beers says synthetic production poses little threat to its market for traditional mined gems, quoting research showing that 94 percent of women want real -- not synthetic -- diamonds.

Machines have been developed by De Beers that can tell even colorless synthetic gem diamonds from the real thing, to prevent synthetic diamonds being passed off as mined gems.

"A diamond's value is based on its inherent rarity," DTC global marketing chief Stephen Lussier told Reuters. "They are all as old as the world. The world has stopped making diamonds."

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D: Checking Understanding

Read the whole article and then read the questions below. Work in pairs to say (or write) answers to these sentences, using what you have learnt from the article and your own ideas:

1. You are an investment analyst. A client wants to know if it would be a good idea to invest in synthetic diamonds in the next fifty years. What advice would you give her?
2. What changes in manufacturing diamonds have occurred in the last fifty years?
3. Synthetic diamonds can be used for all kinds of things now. What do you think is their most important use?
4. Do you think diamonds as jewelry will have the same popularity with women in the future?

Post-Reading Activities

You may do one or more of these.

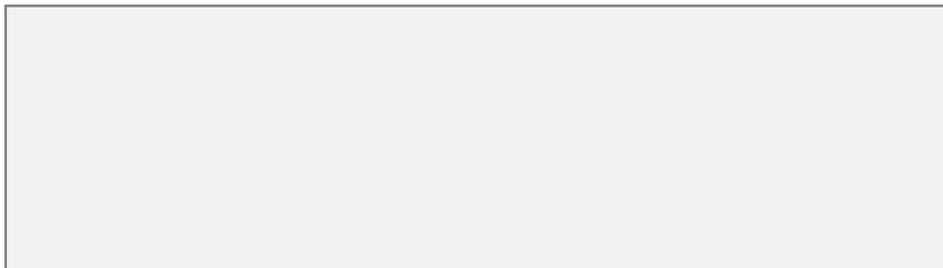
A: Superbrain Quiz

Your teacher will read you some questions based on information from Pre-Reading Activity A and today's article. Work in teams. The team who answers most questions correctly is the winner.

B: Design And Draw

Every woman loves a diamond or so they say! Work in pairs and design a piece of jewelry using diamonds. Draw a picture of your design and write a description of it.

After you have finished, invite other pairs to look at your design. As a class, choose some winners; 'the most interesting design', 'the most beautiful design' etc.



C: Language

In today's article it says that "*some 200 tons of tiny synthetic diamonds are used by industry each year*".

This sentence is written in the passive.

We use the passive voice when we want to concentrate on or emphasize the receiver - the person or thing acted upon. In the sentence above from the article the word '**diamonds**' is important.

"*Industry uses some 200 tons of tiny synthetic diamonds each year.*"

This sentence means the same thing but the **subject** is different and the word '*diamonds*' is now the **object** of the sentence.

'*Industry*' is the **subject** and the **focus** of the sentence is different.

We form the passive of a verb using a form of the **auxiliary verb (be)** with the **past participle** of the main verb.

E.g. *are used* (This is the present simple passive.)

Here are other examples from the article:

...relatively few gem quality stones were produced.... (This is the simple past passive.)

Machines have been developed by De Beers that can tell even colorless synthetic gem diamonds from the real thing.

(This is the present perfect simple passive.)

Rewrite these sentences from the article using the passive voice and the sentence prompts.

1. For centuries diamonds have lured women up the aisle.

For centuries women... _____

2. The durability of diamonds at high temperatures may revolutionize high-performance processors.

High-performance processors... _____

3. The use of diamond rather than silicone can reduce the amount of circuitry by up to 80 percent.

The amount of circuitry... _____

4. Advances in synthetic production have opened the floodgates to ever more innovative applications.

The floodgates... _____

5. The CVD process gives the producer more control over the diamond produced.

Using the CVD process the producer... _____

6. De Beers estimates the potential market for industrial diamond applications at \$50 billion.

The potential market... _____

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TEACHERS' NOTES AND ANSWER KEY

Pre-Reading Activities

A: sharing Information - Notes

1. Students first share any knowledge they have about diamonds.
2. This is a fairly demanding exercise for students. Cuut up and give each student **one** of the sentences **on the next page** and allow them a little time to understand and memorize the information in the sentence. Collect the sentences back. Then ask students to mingle and teach each other the information they have learnt. You may allow them to take notes if you wish or else just to listen and remember. If you think this is too demanding for your students, as some of the information is quite complex, they can keep their sentences and use them as prompts as they talk to other students.

A: Sharing Information - Sentences To Be Given To Students on next page.

Reading Activities

A: Comparing Information - Notes

Students read the sentences and see which ones contain information mentioned in Part One of the article. This is an easier activity than it looks - most of the sentences contain information from Part One.

A: Comparing Information - Answers

Sentences that contain information from Part One: 1,2,3,4,5,7,9,10.
Sentences that don't contain information from Part One: 6,8.

B: Completing A Chart - Answers

a)carbon is compressed using molten metal as a catalyst. b) General Electric c) gases have a chemical reaction. d) particular shapes of diamonds. e) for use in microprocessors. f) the diamond produced.

C: Matching Information - Answers

a. 6, b. 4, c. 2, d. 1, e. 5, f. 3.

D: Checking Understanding - Sample Answers

1. It would be a good idea to invest in a synthetic diamond company like Apollo that is using technology to increase the ways diamonds are used in industry. Diamonds are extremely durable and experts believe they will be used more and more in the future - therefore a synthetic diamond manufacturing company should have good growth.
2. CVD is a new way of producing synthetic diamonds that has allowed the producers to have more control over what is produced and what shape the stone is. This means they can control the shape and this has increased the number of uses of synthetic diamonds. It also means that colorless diamonds for use in jewelry may be manufactured too.
3. For use in electric cars as this will be a welcome alternative to gasoline-powered cars. (Students may give other answers.)
4. Answers will vary. Synthetic diamonds may look no different to mined diamonds in the future. However, some people feel that women will still prefer mined gems because of their rarity and age.

Post-Reading Activities

A: Superbrain Quiz - Questions

- a. What mineral is diamond the crystalline form of?
- b. How are diamonds formed?
- c. In which country are large amounts of diamonds found?
- d. In which other places have diamonds been found?
- e. Which kind of diamond is the hardest?
- f. Which mined diamonds are commonly used in industry?
- g. What can sheets of polycrystalline diamond be used for?
- h. What is the name of the world's biggest producer of diamonds?
- i. What is the total value of the diamonds mined each year?
- j. What is special about diamonds and electricity?
- k. What does CVD stand for?
- l. What is CVD?
- m. How many tons of synthetic diamonds are used in industry each year?
- n. What color are most of the diamonds produced using HPHT?
- o. What are these stones called?
- p. Describe what thickness diamonds need to have to be used in microprocessors.
- q. What does the figure of \$50 billion from today's article refer to?

A: Superbrain Quiz - Answers

a. Carbon. b. Under great heat and pressure, often in volcanic pipes. c. In South Africa. d. In Russia, Brazil, Australia, Siberia and Canada. e. Colorless diamonds. f. Black diamonds. g. As semiconductors. h. De Beers Group i. Nearly \$9 billion j. They can be used as semiconductors at very high temperatures. k. Chemical Vapor Deposition l. A way of manufacturing diamonds in which diamonds are formed when gases have a chemical reaction. m. 200 tons. n. Yellowish brown. o. Canaries. p. They need to be wafer thin (i.e. extremely thin). q. It is the estimated market figure for industrial applications for diamonds.

C: Language - Sample Answers

1. For centuries women have been lured up the aisle by diamonds.
2. High-performance processors may be revolutionized by the durability of diamonds at high temperatures.
3. The amount of circuitry can be reduced by up to 80 percent by the use of diamond rather than silicone.
4. The floodgates to ever more innovative applications have been opened by advances in synthetic production.
5. Using the CVD process the producer is given more control over the diamond produced.
6. The potential market for industrial diamond applications is estimated by De Beers to be \$50 billion.

Student Sentences

- a. Diamond is the crystalline form of the mineral, carbon.
- b. Diamonds are formed under great pressure and heat, often in volcanic pipes.
- c. Large amounts of diamonds are mined in South Africa.
- d. Deposits of diamonds have been found in Russia, Brazil, Australia, Siberia and Canada.
- e. Colorless diamonds are the hardest kind of diamond and these are greatly prized as gemstones.
- f. 'Black' diamonds are used in industry for such things as drilling bits or abrasives.
- g. Sheets of polycrystalline diamond can be produced in industry.
- h. Sheets of polycrystalline diamonds can be used as semiconductors, conducting electricity.
- i. De Beers Group is the world's biggest producer of diamonds.
- j. About 26,000 kgs of diamonds are mined each year, valuing nearly \$9 billion.

