Cambridge English for
Scientists
ADDITIONAL ACTIVITIES

UNIT 8 Nobel Prize in physics 2010

a **The 2010 Nobel Prize for physics was awarded to two scientists, Andre Geim and Konstantin Novoselov, for research on graphene. Watch the short video about the research** http://www.sixtysymbols.com/videos/nobelprize2010.htm **and make notes on the following questions.**

1 What was Geim and Novoselov's idea?
2 How is graphene different from graphite?
3 How did Geim and Novoselov make graphene?
4 Why is graphene's structure exciting for physicists and chemists?

b **Watch the video again. Number sentences a–d in the order you hear them on the video.**

a And then what they did is they found another surface and pushed the thing down and peeled off the sellotape and it stuck.
b If we make a mark with a pencil, what we're doing is we're depositing little sheets, atomic sheets of, of carbon on the paper.
c Well, what, what, uh, Andrei and Konstantin had was the crazy idea of making a transistor structure out of a single atomic sheet.
d What Kostia and Andrei did in Manchester, uh, was to look at electronic properties of graphene.

c **Sentences a–d in Exercise b add emphasis by using the structure What subject + verb + is/was + noun/clause. The information being emphasised moves to the end of the sentence.**

e.g. Kostia and Andrei looked at electronic properties of graphene.

→ What Kostia and Andrei did was to look at electronic properties of graphene.

Underline this structure in sentences a–c.

d **Use the structure *What* SUBJECT + VERB + *is/was* + NOUN/CLAUSE to add emphasis to the following sentences.**

a I'm trying to put the dopant onto the sheet.
b I needed to see if doping graphene could neutralise the negative change.
c I've tried using gold and nitrogen dioxide.
d We add boron into the crystal structure to change its properties.

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UNIT 8 Noun phrases

a **Look at the table below which shows the structure of the noun phrases in the sentence in Exercise 9a.**

Pre-modifier		Headword	Post-modifier
determiner/ quantifier	**adjective/noun**		
The	-	**movement**	of the Fermi level towards the Dirac point
-	-	**deposition**	of F4-TCNQ
-	electron	**transfer**	-
-	-	**graphene**	-
the	-	**molecule**	-

b **Complete the last 8 rows of the table in the same way with the noun phrases from the sentences in Exercise 9b. In the first sentence, the noun phrases have been underlined to help you.**

1 The ability of a gecko to walk on walls demonstrates that activation of the adhesive system improves the gecko's movement over smooth surfaces.
2 The formation of a CaP layer on the surface allowed further crystal growth.
3 Although the species M. fortunata has a lower exposure to vent fluids, it seems to have a higher accumulation of metals in its tissues.

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UNIT 8 Teacher's Notes

Nobel Prize in physics 2010 and adding emphasis

a **Explain to the students that the 2010 Nobel Prize for physics was awarded to two scientists, Andre Geim and Konstantin Novoselov, for research on graphene. They watch the video (http://www.sixtysymbols.com/videos/nobelprize2010.htm) and make notes to answer the questions.**

Answers

1 To make a transistor structure from a single carbon layer.
2 Graphite is made up of many layers of carbon stacked on top of each other. Graphene is one of these layers in isolation.
3 They took a piece of graphite, pressed a piece of sticky tape onto it and peeled off a thin sheet.
4 Because the graphene is only one atom thick, there are free potential bonds. The sheet therefore has special properties. In addition, because it's so thin, it is very flexible.

b **Students watch the video again and number sentences a-d in the order they hear them.**

Answers

1 c 2 b 3 a 4 d

c **Explain that the sentences all use the What subject + verb + is/was + noun/clause structure to add emphasis, as shown in the example (from sentence d). Students underline the structure in sentences a–c in Exercise b.**

1 And then <u>what they did is they found another surface and pushed the thing down and peeled off the sellotape and it stuck</u>.
2 If we make a mark with a pencil, <u>what we're doing is we're depositing little sheets, atomic sheets of, of carbon on the paper</u>.
3 Well, what, <u>what, uh, Andrei and Konstantin had was the crazy idea of making a transistor structure out of a single atomic sheet</u>.

Language note

In sentence a, it would be more usual to say what they did <u>*was*</u> because the verbs *did* and *found* are in the past tense. In sentence b, it is possible to omit *we're* after *is* i.e. *what we're doing is depositing …*

d **Students use the structure What subject + verb + is/was + noun/clause to add emphasis to the following sentences.**

Answers

1 What I'm doing is (I'm) putting the dopant onto the sheet.
2 What I needed to see was if doping graphene could neutralise the negative change.
3 What I've tried using is gold and nitrogen dioxide.
4 What we do is (we) add boron into the crystal structure to change its properties.

Language note: *wh-* cleft sentences

The wh- cleft structure is used to add emphasis by shifting the focus to information at the end of the clause. The structure is most often used with *what* although *why*, *who*, *where* etc. are possible. The structure may highlight a noun e.g. *What I've tried using is gold and nitrogen dioxide* or a whole clause or longer stretch of language e.g. *What they did was they found another surface and pushed the thing down and peeled off the sellotape*. For more information on wh-cleft sentences see *Cambridge Grammar of English* pages 786–788. For exercises on the wh-constructions for the students, see Unit 12 of *Exploring Grammar in Context: upper-intermediate and advanced.*

Noun phrases

A **Elicit from the students what the subject of the completed sentence in Exercise 9a is. They are likely to say either *movement* or *The movement of the Fermi level toward the Dirac point*. Clarify that the latter is the noun phrase which forms the complete subject while the former is the head noun in the noun phrase. Use the table to go through the structure of noun phrases, making sure students understand that the elements always come in this order, but that they may not all be present.**

B **Students complete the last 8 rows of the table with the noun phrases from the sentences in Exercise 9b.**

Answers

Pre-modifier		Headword	Post-modifier
determiner/ quantifier	**adjective/noun modifier**		
The	-	ability	of a gecko to walk on walls
-	-	activation	of the adhesive system
the gecko's	-	movement	over smooth surfaces
The	-	formation	of a CaP layer on the surface
further	crystal	growth	-
the	-	species	M. fortunata
a	lower	exposure	to vent fluids
a	higher	accumulation	of metals in its tissues

Language note

Post-modifiers in noun phrases are either often prepositional phrases, or relative or participle clauses. These may also contain noun phrases which can be further analysed into pre-modifier, headword and post-modifier e.g *of the adhesive system* includes a preposition (*of*) followed by a noun phrase which can be broken down into determiner (*the*), adjective (*adhesive*) and headword (*system*). For more information on noun phrases see *Cambridge Grammar of English* pages 318–333.