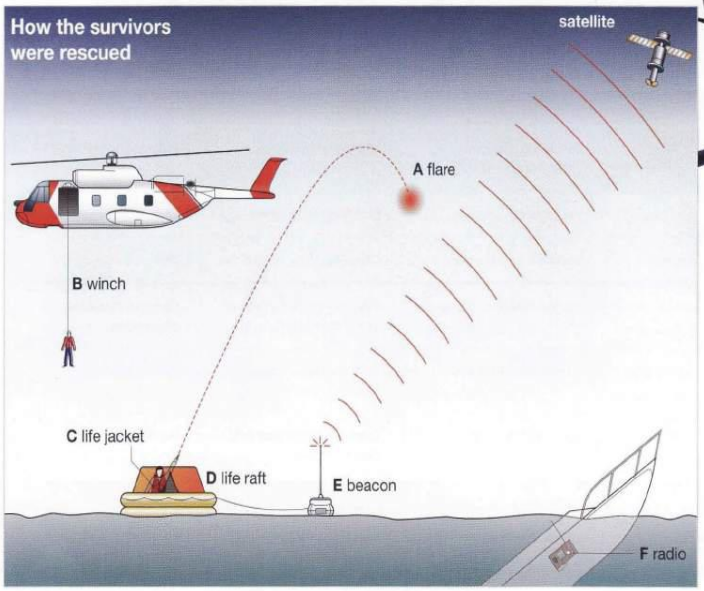
**Objectives**: by the end of this section, Students should be able to:

- listen to a news report about an air-sea rescue
- read an incident report and complete an incident report form
- study and practice using cohesion
- revise asking and answering questions in the past
- learn vocabulary for safety equipment and telecommunications.

# 1 Systems

## 1 Rescue

**Start here** 1 Work in pairs. Answer the questions about the safety devices in this illustration of an air-sea rescue.



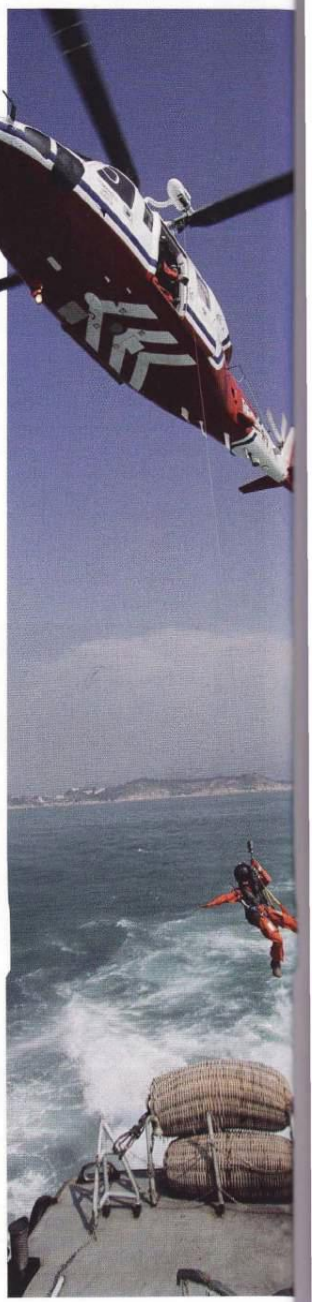

Which ones:
1 stop you from sinking?
2 tell the rescuers where you are?
3 rescue you from the water?

**Listening** 2 02 Listen to this news report and put the six safety devices from 1 in the order the reporter mentions them.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___

3 Put these statements in the order the events actually happened. Then listen again to check your answers.

A ____ The helicopter winched the sailors out of the life raft.
B ____ The sailors inflated the life raft and jumped in.
C 1 The boat struck an object in the sea.
D ____ The sailors fired two flares into the air.
E ____ The boat sank.
F ____ The beacon sent a signal to the satellite.
G ____ The beacon detached itself from the boat.
H ____ The rescue team saw the flares.



**Reading** **4** Read this news article and explain what the words below refer to.

SEVENTY or more kilometres from land, your boat strikes an unseen object and sinks quickly. You have no time to send a radio message. You jump into your life raft. You have flares in your life raft, but they are only visible from a distance of about 5 km. How do you send an emergency signal to the nearest rescue centre?

This happened to two sailors on 18 July this year. They were sailing in the Indian Ocean when their boat, the *Tiger*, struck a sharp object. The boat quickly sank 77 kilometres from the nearest land. They got into their life raft, but their radio was lost when the boat went down.

At 09.30 the coastguard received a signal from the boat's emergency beacon. The coastguard forwarded it to the rescue centre and by 11.00 (only 90 minutes later) the crew of the helicopter found the two sailors and winched them into the helicopter from the life raft. How was the emergency signal transmitted?

Fortunately, the *Tiger* was fitted with a 406 MHz free-floating beacon, which was linked to the Cospas-Sarsat satellite system. When the boat sank, the beacon automatically detached itself from the yacht and floated to the surface. There it switched on automatically and transmitted an emergency signal on the 406 MHz wavelength to the satellite. The satellite then forwarded the signal to the coastguard.

The free-floating beacon and the Cospas-Sarsat satellite system can increase the chances of saving lives in any air-sea rescue, in which the most important thing is to locate the survivors quickly.

1 They (line 14) _____ *the two sailors* _____

2 it (line 25) _____

3 which (line 35) _____

4 itself (line 39) _____

5 There (line 41) _____

6 in which (line 52) _____

kilometres flares visible emergency signal coastguard beacon free-floating satellite automatically megahertz wavelength 03

**5** Complete this incident report form.

**INCIDENT REPORT FORM**

Name of rescue helicopter pilot: *Ricardo Moussa* Date of rescue: _____

Name of boat: _____

Distance of boat from land: _____

Number of people rescued: _____

Time of first emergency signal: _____

Type of emergency beacon: _____

Time of rescue: _____

Method of rescue: _____

**Speaking** **6** Work in pairs. Take turns to be the rescue pilot and a safety officer. The safety officer interviews the pilot and asks questions based on the form.

Examples: *What's your name? When did the rescue take place?*

**Footnotes**:
***life raft*** = radeau de sauvetage
***life jacket*** = gilet de sauvetage
***beacon*** = balise
***Winch*** = treuil
***flare*** = signal lumineux /de détresse

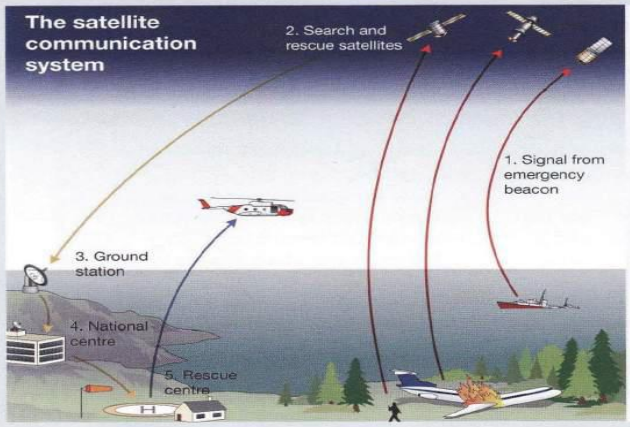
**Objectives** :by the end of this section , students should be ablbe to :

- read and complete a text about how an emergency beacon works in a rescue situation
- listen to a recording about a rescue
- describe a system
- revise and practise non-defining relative pronouns
- practise saying figures and measurements in specifications
- learn vocabulary for telecommunications and satellites

## 2 Transmission

**Start here** **1** Complete this description of how a satellite communication system works, using the correct form of the verbs in the box.

receive convert detach activate carry out transmit locate




If a plane crashes, or a ship sinks, the survivors try to (1) _____ their personal emergency beacons manually. In addition, an automatic beacon (2) _____ itself from the plane or ship and switches on automatically. The beacon then (3) _____ a signal to one or more satellites. The satellites (4) _____ the beacon's transmission and then send the beacon's signal to their ground station. The ground station then processes the satellite signals (that is, it (5) _____ the signals into useful data), and then passes on the data about the beacon to a national centre. The national centre forwards this data to the rescue centre nearest to the crashed plane or sinking ship. The rescue centre then (6) _____ the beacon and sends out a rescue team, which then (7) _____ the rescue.

**Listening** **2** 04 Listen to this discussion and check your answers to 1.

**Reading** **3** Part of this text is missing. Write the letters of phrases A–G below in the correct spaces. Use the illustration in 1 to help you.

**The Cospas-Sarsat system is an international search and rescue system which consists of a network of satellites in space, and control centres on Earth.**

The components of the system are:
- radio beacons, which (1) _____
- satellites, which (2) _____
- ground stations, where (3) _____
- national centres, from where (4) _____
- rescue teams, who (5) _____

The system uses two types of satellite:
- satellites in geostationary Earth orbit (GEO), which (6) _____
- satellites in low-altitude Earth orbit (LEO), which (7) _____


*geo-* = Earth
*Geostationary satellites* move at the same speed and in the same direction as the Earth. When we observe them, they seem to be *stationary* or not moving.

A are closer to the earth and cover polar regions.
B information about the emergency is sent to the rescue teams.
C are at a high altitude and cover a wide area.
D transmit 406 MHz signals in an emergency.
E signals from the satellites are processed.
F pick up the signals from the beacons.
G receive the information and carry out the search and rescue.

**Language** The relative pronoun (for example, *which, who, where*) is a useful way to join two sentences together.

| | | |
|---|---|---|
| Signals are transmitted to | the satellite. The satellite | then sends the signals to Earth. |
| | the satellite, which | |
| The goods are taken to | the warehouse. Here | they are stored safely. |
| | the warehouse, where | |
| This is | the city centre. From here | roads lead in all directions. |
| | the city centre, from where | |
| Ricardo reports to | Waleed. Waleed | is the operations manager. |
| | Waleed, who | |

**4** Join these pairs of sentences into single sentences. Use *which*, *where*, *from where* and *who* to replace the words in italics.

Example: *1 ... to the satellite, from where ...*

1 The beacon sends a signal to the satellite. *From here* the signal is transmitted to the ground station.
2 The rescue centre contacts the helicopter pilot. *He or she* then carries out the rescue.
3 The sailor activated his beacon. *This* sent a 406 MHz signal to the satellite.
4 The sailors were winched into the helicopter. *Here* they were given blankets and hot drinks.
5 The sailors were taken by helicopter to the rescue centre. *From here*, they were driven by ambulance to the nearest hospital.
6 Hundreds of survivors are saved every year by the Cospas-Sarsat system. *This* was first launched in 1982.

**Speaking** **5** Look at the table. Read out items a–h in full.

Example: *(a) (from) two to five kilograms*

**Some facts and figures about the emergency beacon and the satellite system**

| | | | |
|---|---|---|---|
| 1 | Radio frequency of beacon | a) | 2–5 kg |
| 2 | Power (wattage) of beacon signal | b) | 260 mm (h) x 102 mm (w) x 83 mm (d) |
| 3 | Length and frequency of beacon signal | c) | GME 203FF 18756 |
| 4 | Dimensions | d) | 35,000 km |
| 5 | Weight | e) | 406 MHz |
| 6 | Operating range (temperature) | f) | -40°C–40°C |
| 7 | Model number | g) | 5 W |
| 8 | Altitude of GEOSAR satellite | h) | 0.5 sec every 50 sec |

**Task** **6** Match items 1–8 with the correct items a–h in the table in 5.

## EXTRA ACTIVITIES FOR THE TWO SECTIONS

**1** Match the words and phrases 1–8 with the definitions a–h.

1 *h* flares
2 ___ emergency beacon
3 ___ inflate
4 ___ satellite
5 ___ emergency signal
6 ___ winch (v)
7 ___ coastguard
8 ___ life raft

a) a series of radio waves that are sent in an emergency
b) a small rubber boat used by people from a sinking ship
c) to lift someone or something with a wire and a lifting machine
d) the organisation that helps boats in danger
e) a machine that is sent into space and orbits the earth
f) a device that sends a signal in an emergency
g) to fill something flexible with air so that it becomes larger
h) emergency devices that produce a bright flame

**2** Use the words and phrases 1–8 in 1 to complete this news story.

**Emergency beacon aids rescue from sinking boat** *23.12.09*

[1] Three men were rescued from a sinking fishing boat in the Gulf of Mexico today. The 32-foot-long boat was equipped with an (1) *emergency beacon* **that** helped rescuers locate **the vessel** in the early-morning darkness, a Mexican Coastguard spokesperson said. The fishermen said they were asleep on the boat when a wave hit **their** vessel. They could not send a radio message or make a cell phone call.

[2] The (2) _____ station in Veracruz was notified that the ground station had received an (3) _____ from the boat's EPIRB (emergency position indicating radio beacon; this sends a signal **that** is picked up by a (4) _____ and is transmitted to the ground station).

[3] A helicopter was despatched to the area. As **it** approached, one of the fishermen set off one of the red (5) _____ **which** were kept on board, and the helicopter crew saw it.

[4] The fishermen were about to (6) _____ their (7) _____ when the helicopter reached **them**. The helicopter crew managed to (8) _____ the three men to safety, and then flew them to the coastguard station, **where** they were given hot drinks and dry clothes.

**3** Explain what the words in bold in 2 refer to.

1 that (para 1) *an emergency beacon*
2 the vessel (para 1) _____
3 their (para 1) _____
4 that (para 2) _____
5 it (para 3) _____
6 which (para 3) _____
7 them (para 4) _____
8 where (para 4) _____

**2** Complete the description of how an FDR's locator beacon works. Use the correct form of one of the words in each pair for each gap.

activate/deactivate attach/detach manually/automatically receive/transmit
release/fasten sink/float winch up / lower

The circular memory units with the flight data are stored in a large rigid cylinder that is (1) fastened onto the base of the FDR. The FDR is usually mounted in the tail section of the plane. In an accident, it becomes (2) _____ from its mount. There is a submergence sensor on the side of the FDR's beacon. When water touches the sensor, this (3) _____ the beacon (4) _____. The beacon can (5) _____ signals under water and above ground. Because of the weight of the FDR, it does not (6) _____ on the surface of the water, but comes to rest on the seabed. After a diver has located the FDR on the seabed, it is (7) _____ and transported to the computer lab for analysis.

**3** Join these pairs of sentences into single sentences. Use *who, which, where, from where* to replace the words in italics.

Example: *I ... TWA Flight 800, which crashed ...*

1 A serious air disaster occurred with TWA Flight 800. *It* crashed into the Atlantic in 1996.
2 The accident was caused by a build-up of fuel vapours in a fuel tank. *It* exploded.
3 Twelve minutes after take-off, the last radio transmission was received at Boston. *Here* the weather was fine.
4 The explosion was seen by another pilot. *He* was flying in the area at the time.
5 The other pilot landed at Boston airport. *From here* he contacted the air crash investigators.
6 An air and sea rescue was conducted in the area. *This* lies off the coast of New York State.
7 The FDR was recovered a week later by divers. *They* were guided to it by an emergency beacon.
8 The wreckage was transported to the shore. *From here* it was taken away for examination.

**Objectives:** At the end of the lesson, students should be able to:

- Follow instructions to carry out a metal's extracting process.
- Describe how iron is smelted in a Blast Furnace
- Identify stages in descriptions
- Understand why the passive voice is much used
- Describe how steel is produced in a Bessemer Converter or an electric arc furnace.

# Title: EXTRACTING METALS

**STARTER**: *Metals are very rarely found in a usable form. They normally occur in an ore, that is, as part of a piece of rock. How do you think, then, that man first discovered metals?*

**ANSWER**: *Since nobody knows for certain how man discovered metals, there is obviously no one right answer here. One such explanation is that rocks containing ores were used by Early Man to build fires on. In some cases the heat of the fire may have caused smelting which means separation of the metal from its ore. Presumably Early Man noticed this, and began experimenting with heating up these and other kinds of rocks, until eventually the metals we know today were discovered.*

**TEXT**:

Separating a metal from other minerals in the ore is known as extraction or smelting. Most metals are smelted using heat, although some, e.g. aluminium are extracted by an electrical process.

Iron is smelted in a tall metal tower, called a blast furnace. The tower is lined with fire- brick[1] and is normally kept burning continuously for several years. Four ingredients are needed: iron ore, coke, limestone and hot air.

A mixture of crushed iron ore, coke and limestone is taken in a skip[2] up a ramp and fed into the top of the furnace. Hot air is blasted into the base of the fire to produce a very high temperature ($1{,}800^0C^*$).

The smelting process produces three substances: gas, molten ore and slag. The gases escape through an outlet at the top of the furnace. The liquid iron settles at the bottom of the tower. The slag, which consists of the molten limestone and all the impurities it, has absorbed, also runs down to the bottom; but, since it is lighter than the liquid iron, it floats on top of it. Periodically, the iron and the slag are drained off through valves at the bottom of the tower.

When the iron leaves the furnace, it still contains some impurities, particularly carbon. Some of the molten iron is run off into large molds* called pigs, where it is cooled ready for further refining and processing into cast iron at a later stage. The remainder is taken away in its molten state for further processing into wrought iron[3] or steel.

***There are three stages in the description of iron smelting:***

1. General principle = 1st paragraph.
2. Equipment and Ingredients= 2nd paragraph.
3. .Process= 3rd and 4th paragraph.

***There are three stages in description of the process too:***

- ***Filling=*** *3rd paragraph, from* **"** A mixture of crushed ... top of the furnace**"**
- ***Blasting****= 3rd – 4th paragraph, from* ***"Hot air is blasted ... floats on top of it."***
- ***Emptying****= the rest of the text*

**Footnotes**:
***Fire- brick*** = a kind of brick used to cover the inside of a furnace= **briques réfractaires** (Fr)
***A skip*** = a container which is open at the top = **benne** (Fr)
***Wrought iron*** = iron which has been beaten into shape = **fer forgé**.

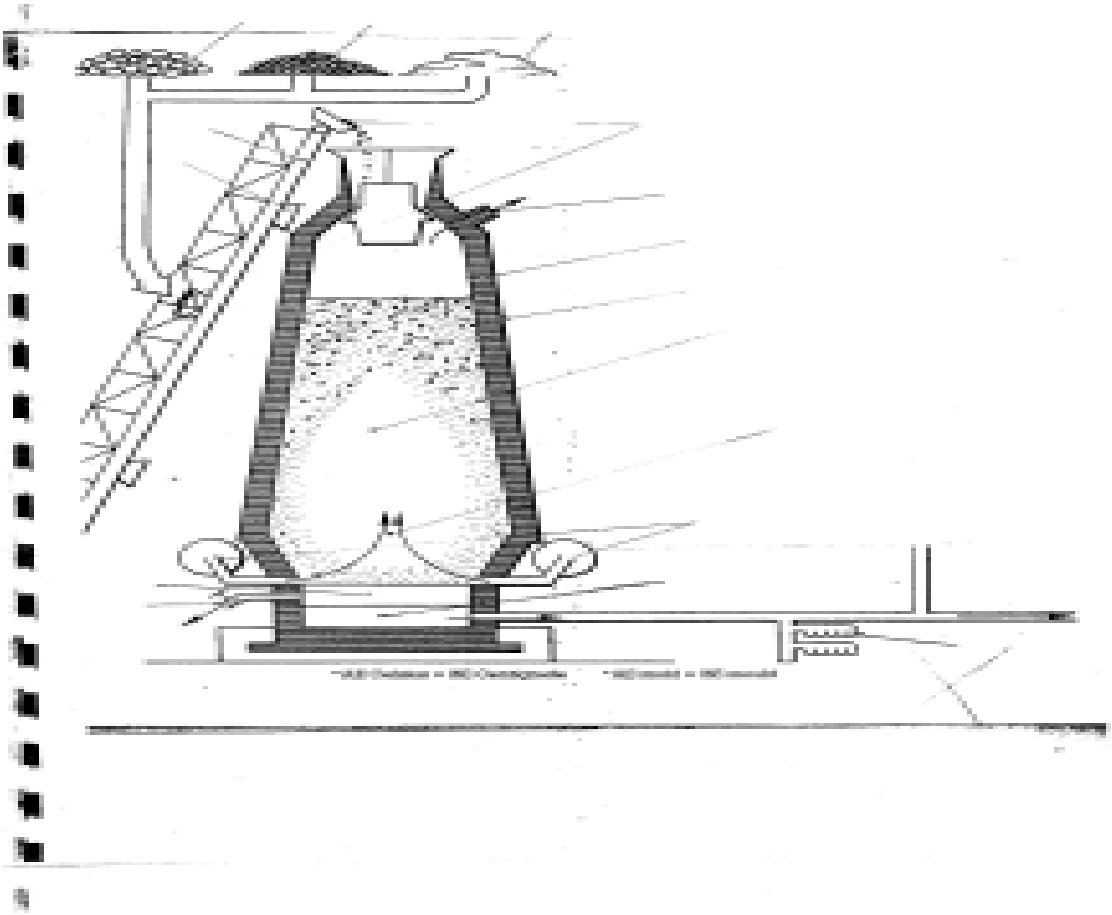
## I. READING COMPREHENSION

### *A. Read the text and connect the two matching parts of the sentences*

| | |
|---|---|
| **1.** Heat | **a.** is blasted through the furnace. |
| **2.** Iron | b. runs to the bottom of the tower. |
| **3.** The iron ore | **c.** is used to smelt iron. |
| **4.** Limestone | **d.** is extracted from its ore in a blast furnace. |
| **5.** The furnace | **e.** is mixed with coke and limestone. |
| **6.** Hot air | f. is needed to absorb the impurities. |
| **7.** Liquid iron | **g.** are made from the molten iron. |
| ***8.*** Slag | **h.** is kept alight continuously. |
| **9.** Four basic products | **i.** *Settles on top of the liquid iron.* |

### *B. Label this picture of a Blast Furnace using the expressions below*

A blast furnace/ iron ore/ coke/ fire-brick lining/ slag tap/ molten iron /gas outlet/ furnace/pigs / blast boxes /limestone/ metal tower/ iron ore, coke and limestone mixture / liquid slag / skip/ ramp/ hot air



### C. ***Find words and expressions from the text which mean the same as:***

***10.*** *Forced under high pressure* = _____
***11.*** *To take out* = _____
***12.*** *Is called* = _____
***13.*** *Covered on the inside* = _____
***14.*** *Broken into small pieces* = _____
***15.*** *The bottom* = _____
***16.*** *Melted* = _____
***17.*** *Unwanted substances* = _____
***18.*** *At intervals* = _____
***19.*** *Especially* = _____

### D. ***Complete this summary of the text with the right word.***

In the [20] _____ of iron four [21]_____ are needed: iron [22]_____, coke to [23]_____ the [24]_____, limestone to [25]_____ the [26]_____ in the ore and [27]_____to produce the high [28]_____ required. In the heat of the [29]_____, the [30]_____ separates from its ore and [31]_____ as a [32]_____

at the bottom of the furnace. On [33]_____ of the [34]_____ iron is the [35]_____.At intervals, the [36]_____ and the slag are [37]_____ off. Some of the iron is [38]_____ in [39]_____ immediately; some is [40]_____ further.

***E. <u>Answer these questions based on your understanding of the text.</u>***

**40.** Why is the passive voice much used?

- The passive voice is much used because it makes it possible to keep the attention on the process, which is the main focus of the description.

**41**. What are the four products made from the molten iron?

**a. Pigs / pig iron**

**b. Castings/ cast iron**

c. _____

d. _____

## II. LINGUISTIC AND COMMUNICATIVE COMPETENCE

**F. a)** <u>Here is an example of an electrical process or electrolysis</u>: ***Aluminium extraction***.

Aluminium is extracted <u>by</u> electricity in a special cell. The bottom <u>of</u> the cell is lined <u>with</u> carbon. This provides an anode. <u>At</u> the top of the cell are graphite electrodes, which act as cathodes. Two additional substances are needed in the process: copper and salt. The aluminium is first alloyed <u>with</u> copper, then heated and poured <u>into</u> the cell. On top of the alloy is a layer of molten salt. This is lighter than the alloy, but heavier than pure aluminium. An electric current passes through the alloy <u>between</u> the anode and the cathode. The aluminium is drawn <u>to</u> the cathode and settles <u>on top of</u> the salt. Periodically, the aluminium is drained <u>off</u> and cast <u>into</u> shapes.

***b) <u>Use words from the box to complete the production of steel in a Bessemer Converter</u>:***

| **excess - hot air - molten - tilted - heating** |
|---|

**GENERAL PRINCIPALE:** Steel is produced by [42]_____iron to reduce the amount of carbon in it.

**EQUIPMENT AND INGREDIENTS:** The iron is heated in a furnace called a Bessemer Converter. Two ingredients are needed: molten iron and [43]_____

**PROCESS: -filling.** The furnace is [44]_____ and the molten iron is poured in. The converter is then returned to an upright position.

**- blasting.** Hot air is blasted into the bottom of the furnace. The [45]_____ carbon escapes from the top as carbon gas.

**- emptying.** The furnace is tilted again, and the [46]_____steel is poured out in a container.

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