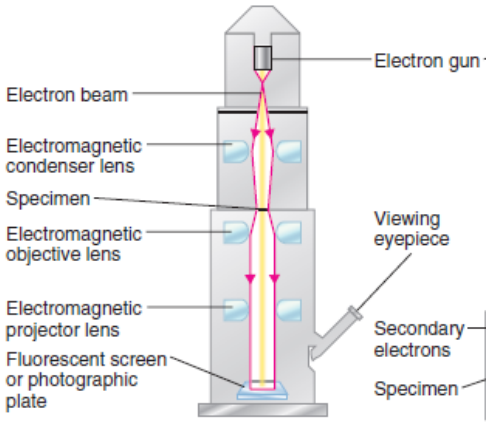
Microscope/microbiology worksheet

Transmission Electron Microscopy

In the **transmission electron microscope** (TEM), a finely focused beam of electrons from an electron gun passes through a specially prepared, ultrathin section of the specimen (Figure 3.10a). The beam is focused on a small area of the specimen by an electromagnetic condenser lens that performs roughly the same function as the condenser of a light microscope—directing the beam of electrons in a straight line to illuminate the specimen.

Electron microscopes use electromagnetic lenses to control illumination, focus, and magnification. Instead of being placed on a glass slide, as in light microscopes, the specimen is usually placed on a copper mesh grid. The beam of electrons passes through the specimen and then through an electromagnetic objective lens, which magnifies the image. Finally, the electrons are focused by an electromagnetic projector lens (rather than by an ocular lens as in a light microscope) onto a fluorescent screen or photographic plate. The final image, called a *transmission electron micrograph*, appears as many light and dark areas, depending on the number of electrons absorbed by different areas of the specimen.

The transmission electron microscope can resolve objects as close together as 10 pm, and objects are generally magnified 10,000 to 100,000×. Because most microscopic specimens are so thin, the contrast between their ultrastructures and the background is weak. Contrast can be greatly enhanced by using a "stain" that absorbs electrons and produces a darker image in the stained region. Salts of various heavy metals, such as lead, osmium, tungsten, and uranium, are commonly used as stains. These metals can be fixed onto the specimen (*positive staining*) or used to increase the electron opacity of the surrounding field (*negative staining*). Negative staining is useful for the study of the very smallest specimens, such as virus particles, bacterial flagella, and protein molecules.



A Read the text and find the synonyms for these words:

1 very thin (1)

2 approximatively (1)

3 to shine light on sth (1)

4 to make look larger (2)

5 last (2)

6 to start to be seen (2)

7 to determine (3)

8 to improve the quality (3)

B Read the text and answer the questions:

1 Which part of the electron microscope is used to direct the beam of electrons onto the specimen?
2 Which part of the EM controls focus?
3 Where is the specimen usually placed in the EM?
4 Does the beam of electrons pass first through the specimen or the objective lens?
5 How do you call the picture obtained by the EM?
6 What is the resolution and the magnification of the EM?
7 How do you improve the contrast?
8 What is the difference between positive and negative staining?

How to properly prepare and use a microscope

Listen and complete:

Step 1 When transporting a microscope, always use _____, using your left hand to hold the _____. Hold the _____ with your right hand for support.
Step 2 Rotate the revolving _____ to the lowest power or the shortest _____ lens
Step 3 Fasten the microscope _____ to the stage using the stage _____
Step 4 Use the coarse adjustment _____ to lower the lenses as far as they will go without touching the _____
Step 5 While looking through the _____, you can maintain better viewing by keeping both eyes open
Step 6 Adjust the light source and _____ to get the greatest amount of light
Step 7 Slowly turn the _____ adjustment knob towards your body
Step 8 Use the _____ adjustment knob to focus the image as much as possible
Step 9 Move the _____ to centre the image in your filter view
Step 10 Rotate the _____ nosepiece to increase the objective lens power
Step 11 Use the coarse adjustment knob to _____ the objective lens
Step 12 _____ the slide and click the lowest power objective lens into position

Match the parts of the microscope with their function:

1 The ocular lens	a) is used for moving the stage greater distances
2 The body tube	b) hold the slides in place
3 The arm	c) is used for focusing the specimen
4 The base	d) is used to vary the intensity and size of the cone of light
5 The light source	e) supports the tube and connects it to the base
6 The stage	f) connects the eyepiece to the objective lenses
7 Stage clips	g) is usually 10-15 magnification
8 The revolving nosepiece	h) is used to send light up to the bottom of the stage
9 The diaphragm	i) is the flat platform for placing slides
10 The coarse adjustment knob	j) holds two or more objective lenses
11 The fine adjustment knob	k) is the bottom of the microscope and is used for support

Grammar corner – relative clauses

93.1 **In some of these sentences you need who or that. Correct the sentences where necessary.**

1 The woman lives next door is a doctor. — The woman who lives next door
2 Have you found the keys you lost? — OK
3 The people we met last night were very nice. —
4 The people work in the office are very nice. —
5 The people I work with are very nice. —
6 What have you done with the money I gave you? —
7 What happened to the money was on the table? —
8 What's the worst film you've ever seen? —
9 What's the best thing it has ever happened to you? —

94.3 **Complete each sentence using who/whom/whose/where.**

1 What's the name of the man whose car you borrowed?
2 A cemetery is a place _____ people are buried.
3 A pacifist is a person _____ believes that all wars are wrong.
4 An orphan is a child _____ parents are dead.
5 What was the name of the person to _____ you spoke on the phone?
6 The place _____ we spent our holidays was really beautiful.
7 This school is only for children _____ first language is not English.
8 The woman with _____ he fell in love left him after a month.