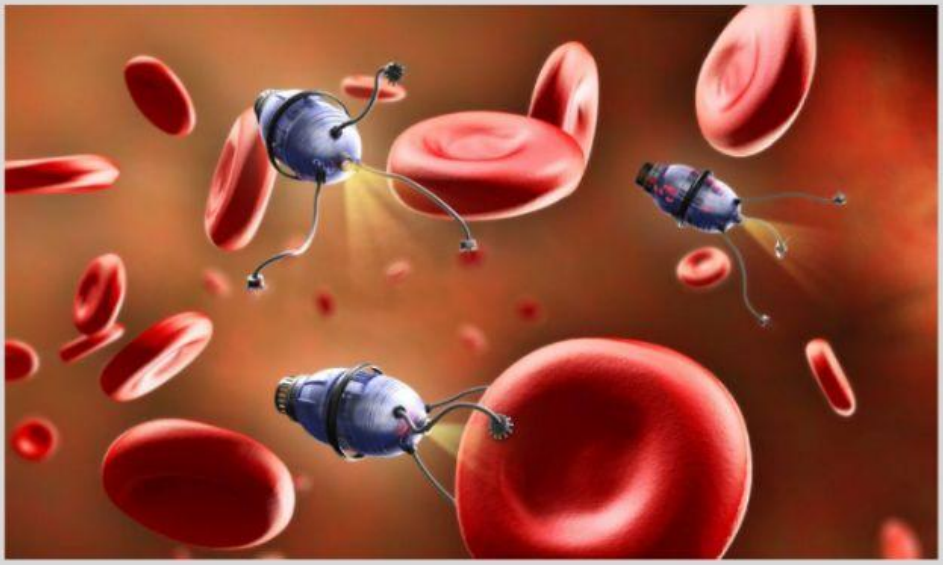
Reading 3

Skills:

- Details
- Scanning
- Cause-effect

Getting started: Do you know what nanotechnology is?

USES OF NANOMEDICINE



Nanotechnology is science, engineering, and technology conducted at the nanoscale, which is about 1 to 100 nanometers (one nanometer is 0.0000001 cm). Nanoscience and nanotechnology are the study and application of extremely small things and can be used across all the other science fields, such as chemistry, biology, physics, materials science, engineering, and medicine.

In medicine, artificially created molecules the size of proteins, which are able to move along the blood stream and individual cells, could be an incredibly useful tool for delivering drugs throughout the body. Nanomotors could be used to direct helpful molecules to organs where they're needed. The choice of materials used to build these machines and structures also helps them to effectively achieve their function. Rings of carbon atoms provide strength and could be used to help repair bone, while nanoparticles filled with gold or silver can be used to destroy cancer cells or unwanted bacteria.

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Ensuring that therapeutic drugs reach their cell targets is not an easy task when you're dealing with a complex organism like a human. Drugs may not arrive at the right destination, and those that do may not be able to enter the cells. The use of nanoparticles called liposomes, which are able to carry drugs into cells, may be a way to overcome this obstacle. Liposomes surround the drug particles and help guide them to their destination. Once a liposome makes contact with a cell, it is slowly immersed in a process called endocytosis. The liposome usually breaks down slowly inside the cell, but X-rays can be used to rupture the fatty layers more rapidly, so that they release their tiny parcels of drugs.

Surgery, chemotherapy and radiotherapy are currently the three main ways of treating cancer. Surgery to remove tumors can be very effective, but it is not suitable for all types of cancer. Chemotherapy is also highly effective at killing cells, but destroys them indiscriminately, attacking both cancerous and healthy tissue, which can leave patients with severe side effects. Radiotherapy can be targeted at a particular region, but also carries side effects and the risk of causing infertility. On the contrary, nanoparticles could be used to carry a sequence of DNA into cancerous cells, resulting in the production of a toxic compound inside the cells that kills them. Nanoparticles like this have been successfully used in rats to attack brain cancer cells and tumors, while leaving healthy tissue unharmed. It is hoped that the same technology could one day be used to fight the disease in humans, with few or perhaps even no negative side effects for the patient.

**Adapted from How it Works – World of Tomorrow. Fifth Edition. DK Publishing.*

Complete the following cause-effect chart:

Action	→	Effect
1. Selecting the right material	→	
2. Using liposomes	→	
3. Using chemotherapy	→	
4. Using radiotherapy	→	
5. Nanoparticles for cancer treatment	→	

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