Name: _____

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Book 3

TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Be sure to read all the directions carefully.
- Most questions will make sense only when you **read the whole passage**. You may read the passage more than once to answer a question. When a question includes a quotation from a passage, be sure to keep in mind what you learned from reading the whole passage. You may need to review **both** the quotation and the passage in order to answer the question correctly.
- Read each question carefully and think about the answer before writing your response.
- In writing your responses, be sure to

  —clearly organize your writing and express what you have learned;

  —accurately and completely answer the questions being asked;

  —support your responses with examples or details from the text; and

  —write in complete sentences using correct spelling, grammar, capitalization, and punctuation.

- For the last question in this test book, you may plan your writing on the Planning Page provided but do NOT write your final answer on this Planning Page. Writing on this Planning Page will not count toward your final score. Write your final answer on the lined response pages provided.
- Plan your time.

Directions

Read this article. Then answer questions 46 and 47.

Your Head's Battery

by Sid Perkins

A natural powerhouse in the ear of guinea pigs can run a tiny electronic device, researchers show. Human ears contain that same structure, which operates like a battery. Doctors might one day use this system to power implants. Some might monitor an individual's blood. Others could dispense medicines.

Deep within the ear of all mammals is a spiral-shaped structure called a cochlea (KOKE lee ah). It contains two storage regions, each filled with a different liquid. One fluid contains dissolved minerals, such as potassium, in concentrations close to those found in blood. The other fluid contains a higher proportion of potassium.

A thin membrane separates the two chambers. Cells in that membrane continually pump potassium from one chamber into the other. The difference in potassium concentrations between the chambers creates a small voltage difference. Voltage is a measure of how much energy it takes to move charged particles between two points, or how much energy can be extracted from those moving particles. In the cochlea, this voltage difference normally drives signals that carry sound information along a nerve going to the brain.

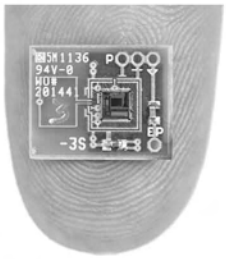
Importantly, there is always a voltage difference between the cochlea's fluid chambers. So it's like a battery that never loses its charge, explains Anantha Chandrakasan. He's an electrical engineer at the Massachusetts Institute of Technology (MIT).

He and his coworkers designed a tiny device to measure changes in the strength of the ear's natural battery. Periodically, the device would then wirelessly transmit the data it had collected.

That battery had to power those transmissions. But the ear's natural battery is far less powerful than those used to run watches or calculators. So circuits in this device had to be very efficient.

To tap into the ear's natural battery, the researchers attached electrodes. One penetrated each chamber of the cochlea. These electrodes had to be very small and provide little resistance to the flow of electricity.

Konstantina Stankovic, an ear surgeon at Harvard Medical School, led a team that implanted those electrodes. Wires connected them to the new device—a computer chip similar to those found in many types of electronics. That chip was small enough to fit on a fingertip. For these early tests, the device itself remained outside the guinea pig's ear.



Scientists have designed a small electronic circuit (inside the two squares) that can monitor the strength of the natural battery in a guinea pig's inner ear.

The tiny device had to collect energy from the ear's battery and then store it until there was enough power to transmit data. The researchers provided the test device with enough starting energy to operate only about 6 minutes. In fact, the device operated for up to 5 straight hours. That shows the device succeeded in pulling power from the ear's natural battery. The device derived enough power to send data every 40 seconds to 6 minutes. The researchers described their findings online November 11 in *Nature Biotechnology.*

Overall, the cochlea's battery provided a little more than 1 nanowatt of power. That's less than one-billionth as much as would be needed to run a faint nightlight. But the device didn't interfere with hearing.

Future versions could be implanted inside the body near the ear, Chandrakasan says. There it might do things such as monitor chemicals in the blood—blood sugar or cholesterol, for example. Alternatively, a tiny ear-powered device might occasionally release small amounts of some medicine into the bloodstream or into tissues near the ear. For such tasks, researchers will need to improve the electrodes and device's circuitry, Chandrakasan says.

Researchers are just beginning to find ways to capture, store and use the body's energy in unusual ways. For example, scientists have designed backpacks that can harvest the energy of a person walking to power a variety of devices. The new ear battery testing "shows you can do neat stuff," says Gene Frantz. He's an electrical engineer at Texas Instruments in Dallas.

But before researchers design implants with complicated circuits to perform many tasks, Frantz says they should ask themselves: "How do I build a circuit that does only what's necessary?" This, he says, might allow scientists to design small devices that won't need more power than the tiny amounts of energy that an ear's microbattery can provide.

Power Words:

auditory nerve The nerve that carries electrical signals that represent sound from the ear to the brain.

battery A device that can convert chemical energy into electrical energy.

cochlea A spiral-shaped structure in the inner ear of humans and other mammals. The natural battery in the mammalian inner ear provides power to drive signals from the ear to the brain. Those signals travel along the auditory nerve.

current The flow of electrical charges through a wire or other electrical conductor.

electrical engineer A researcher who uses the principles of electricity, electronics, and electromagnetism to design or analyze devices that transmit or use electrical power. Examples include computers, radios, and electrical circuits.

implant A device manufactured to replace a missing biological structure, to support a damaged biological structure, or to enhance an existing biological structure. Examples include artificial hips and knees, pacemakers, and the insulin pumps used to treat diabetes.

power The energy used to run machines or devices and is typically measured in watts.

voltage The difference in electrical potential between one point and another—say, for instance, one end of a battery and the other. Electrical potential measures the amount of energy needed to move a charged particle from one spot to another.

46 How does the photograph aid the reader's understanding of the article? Use **two** details from the article to support your response.

47 Why have experts from different fields of study been involved in this research? Use **two** details from the article to support your response.

GO ON

Directions

Read this story. Then answer questions 48 and 49.

In this excerpt, Justin invites his new friend, Jinsen, to visit his father's art studio over spring break.

Excerpt from *Buddha Boy*

by Kathe Koja

We were walking home, on a day finally more spring than winter, chirping birds and actual sun, snow lumps melted down to visible grass, heading this time to my house because the banner was pretty much finished, only minor touch-ups left to do, nothing I could even pretend to help with. So today we were going to look through art books, Picasso and Klee and Monet, all the stuff I'd gotten from my dad and "He's working on a new piece now," I said. "It's black-and-white and big as a car, he says. . . . You know, I'm going to visit him for spring break. Would you—do you want to come with?"

"To your dad's studio, you mean? Really?" and he smiled, a big smile, we both did, but then "For a whole week?" he said; his smile dwindled. "My great-aunt—I don't know."

"You mean she'll say no?" That wavery smile, *Oh Michael,* she didn't seem like the bossy type but "She can check it out with my dad first. Or he could call her—"

"No, I mean I don't know if I can leave her on her own for that long. Maybe if someone came to check, made sure she was OK—"

I almost volunteered Audrey, *Hey, my mom could do it,* but then I thought I ought to ask her first. Still, "Do you always have to, to worry about that stuff?" I asked, as we turned down my street, winding sidewalks beneath elms bare-branched to show last year's birds' nests, squirrels' nests, winter-worn but still intact. The Dalmatian on the corner sniffed through his redwood gate, then barked as we passed, a sharp fierce noise, *strangers!* "It's not fair to you, why can't she just—"

"She's old," he said, which wasn't really an answer but somehow it shut me up, because it was true, she *was* old, old and frail, we walked along in silence until "Your street," he said, as we turned up the driveway. "All the trees, and everything. . . . It's nice."

He thought our house was nice, too, nice and big, which compared to his I guess it was, but I'd stopped seeing his house as small, or shabby, especially his room, which made mine look like a dumping ground for "King Consumer," too much junk piled way too high, stuff I never used or didn't need, or even really want. It was strange, as if I were seeing through his eyes, like catching a glimpse of myself in a mirror, a mirror I didn't know was there.

"How about some herbal tea?" Audrey asked, Audrey who followed us into the kitchen, Audrey who seemed to like Jinsen instantly. "Or oolong, I have oolong," like *shaved head and dragon shirt* must equal *tea drinker*, no stereotypes there.

"We'll just have Cokes," I said, annoyed—until I saw Jinsen's smile, smiling at Audrey, almost wistful and *His mom*, I thought. *She's gone.*

"Tea's good, too," I said.

We spent a while going through the art books—he liked Picasso best, the blunt bent faces, the force behind the brush—but Jinsen looked longest at my dad's painting, looked and touched, one finger gentle on the whorls and flecks of paint. "I don't use oils," he said, "yet. Mostly I do acrylics. . . . Does your dad ever sell his paintings?"

"Not a lot; sometimes. He says he sells just enough to buy the paint to do more."

I picked up my cup, the tea was cold and "When my parents died," Jinsen said, looking down at the painting in his hands, "there was a settlement, and insurance money too, I guess. My great-aunt had it put in some kind of trust, like for when I'm twenty-one. But some of it," red and green, red and green, tracing the circle around, "she gave to me. And that's what I spent it on."

I thought of the tackle box, the paints and brushes. "All of it?"

"All of it. She told me it was mine and I should do whatever I thought was best. So I thought, what would Kim do with it? And then I knew. . . . Kim always told me I ought to go to art school."

"Well, once you get that internship, you—"

"Who knows if I'll get it? If Keeley doesn't like the banner—"

"How can he not like it? It's great, it's—the lion looks alive, all of it is alive—" in spring green and crimson and smoky gray, ideograms like water flowing beneath, STUDENTS OF ASIA AT CAC, and "If he hasn't gone blind," I said, "he'll see how great it is."

"Maybe," he said, and shrugged, but in that moment his face, his gaze, was so still that I could see all the way to the bottom, like looking into a deep clear pond, and what I saw there was a longing so intense that it startled me, a want that was a need, like needing food or air. "I did my best," he said, and looked away. "I just wish I'd had that other scroll to show him, too."

"Don't worry." I said; because I knew, I was sure. "The banner will be enough."

And then "Knock knock," from Audrey, opening the door a crack. "Jinsen, would you like to stay for dinner? I'm making chicken stew," and "Sure," he said, head turned to smile up at her; suddenly he seemed younger, almost like a kid. "Sure, thanks."

Audrey outdid herself with the meal—stew, fresh-baked rolls, corn on the cob—and Jinsen ate everything she put on the table, thanking her again and again. During dinner she asked her usual million questions—what kind of music did he listen to, did he play any sports, how did he like school (I had to roll my eyes at that one)—but to Jinsen, I guess, it didn't seem intrusive. Maybe he liked having a mom give him the friendly third degree, even if it wasn't his mom.

He ended up staying till almost nine o'clock, I wondered what his great-aunt would say but "It's Tuesday," he said to me, as Audrey searched for her car keys. "Tuesday nights she goes to bingo with our neighbor. . . . Thanks again," to Audrey, "for driving me home."

"Oh, it's no trouble at all. Do you have your coat?" which made me cringe a little, but "Well," Jinsen said, past the closing door, "the thing with that is—"

I cleared up the dinner stuff and loaded the dishwasher, as a way to say thank you to Audrey. She didn't come back right away, and when she did I was ready for some more *Oh that poor boy* no-jacket stuff, but "What a sweet family," she said; her voice was soft, almost sad, but in a good way, the way it is when something you see touches you, moves your heart inside. "Jinsen is quite a remarkable young man. And his great-aunt is just adorable—"

"You met her?"

"Only for a minute—You know," hanging up her coat, "your father mentioned that you were asking Jinsen along to his place, for vacation. Do you think his great-aunt might need a little help while he's gone? Just someone looking in, stopping by for a cup of tea or something. . . . I would have suggested it myself, but I didn't want to seem pushy."

"I don't think it would be pushy at all," I said, with a little smile; the tickle of karma again? "I think it would be nice."

48 In "Excerpt from *Buddha Boy*," what theme do lines 35 through 58 develop? Use **two** details from the story to support your response.

49 In "Excerpt from *Buddha Boy*," why are lines 81 through 84 important to the plot of the story? Use **two** details from the story to support your response.

Directions

Read this story. Then answer questions 50 and 51.

Basil's grandmother is giving the new girl in seventh-grade, Tenzie, a tour of their unusual house. Tenzie is trying to become friends with Basil and teasingly nicknames him Pesto.

Excerpt from *One + One = Blue*

by MJ Auch

Gram took Tenzie around the room, showing her the various projects she had going. That's how Gram earned money, by selling her fabric and stained-glass designs from her website. Even though Gram tended to be disorganized, she had managed to keep her small business going well enough to support us. Lately, she seemed to be sending out more orders than ever.

The cell phone rang in the kitchen, and Gram ran to answer it. She could never remember to keep it in her pocket.

That's when I looked over at Tenzie and realized she was crying. I didn't know what to say. I hadn't cried since I was a little kid. This would be the hitch with having a friend because it would be my responsibility to ask what was wrong and try to make it better, wouldn't it? I decided to turn away and hope that Gram's phone conversation would be short and she'd be back to handle this before it got embarrassing.

Then Tenzie made a loud choking sound. She had her hand over her mouth, and her cheeks were glassy with tears. "You're so lucky."

"Me? Why?"

"You live in this mind-boggling place. It can look just the way you and your grandmother want it." Tenzie quickly wiped her eyes. "You don't know how good you have it, Pesto." She went over to a bookshelf and picked up a picture in a frame. "Who's this?"

Ordinarily I would have made something up, but I was set off balance by Tenzie's crying and quick recovery. "It's me and Carly–my mother–when I was little," I said.

"She's beautiful and looks so young for a mother. Where is she now? At work?"

"No. She's gone," I said.

Tenzie looked up, startled.

"No, not that kind of gone. She just left—probably not long after that picture was taken. Took off to Hollywood to become an actress."

"Really?" Tenzie wiped the dust from the glass and studied the picture more closely. "Have I ever seen her in anything?"

"Not unless you get LA used-car commercials on your TV. She's done a couple of those. We haven't heard from her in a while."

"It must be fun to go visit her in Hollywood, though." Tenzie carefully replaced the picture on the shelf. "Where's your father?"

"Never met him." I didn't want to get into my family stuff with Tenzie. Then there was a flash of light, followed by a loud boom that set the sun catchers quivering. Just as I noticed that there was no sun left for them to catch, the dome was pelted with rain. I was saved.

Gram appeared in the doorway. "Looks as if your father was right this time, Tenzie."

"Yeah," Tenzie said. "Maybe he's finally getting the hang of this meteorology business." She grinned at me. "We might even get to do some wall painting for a change."

For a storm that wasn't supposed to happen, the rain put on a spectacular show. There was lightning that crackled all the way to the ground followed by one clap of thunder after another.

"I bet Dad is really enjoying this," Tenzie said. "He loves weather extremes. The last place we lived was San Jose, where it was in the seventies and sunny almost every day. Dad got so bored, he started making things up for his weather report. Naturally, he got fired."

A sudden stream of water splatted on the floor, then another and another. "Grab the pans, Basil," Gram shouted. She kept a supply of old dented thrift shop pots and pans in the corner of the hippie room, because every time it rained, the dome leaked something fierce. The three of us ran around the room sliding pots under the leaks.

The sound of the pans catching rain was almost musical. The bigger the pot, the lower the note, and each leak had its own tempo of drips, so there was a lot of syncopation going on. Soon we had an orchestra of nine pans in strategic places catching water.

Gram grabbed a small African drum called a *djembe* from under her stained-glass worktable and started beating her own rhythm on it. "I use the drum to unwind when I've been working on a glass project that sets my nerves on edge," she called over the din. "You can actually get your own pulse to speed up or slow down with these things. There are more drums under there. Help yourself, Tenzie. Drumming isn't meant to be a solitary thing."

Tenzie pulled out my favorite drum and started in, following Gram's rhythm as if she had been drumming all her life. "This is amazing," she said, throwing back her head and laughing.

Gram's eyes were closed now, and she slipped into her own little world. I knew that feeling, where the cadence of the drum carried you away somewhere. But I wasn't being carried away anywhere. I was watching from the outside while my grandmother and my friend . . . no, guest . . . bonded without me. First Tenzie had taken over my desk in the cafeteria, then she had invaded my seat on the bus. Now she was squeezing herself into my family.

And I didn't like it.

50 In "Excerpt from *One + One = Blue*," what effect does the difference in Basil's point of view and Tenzie's point of view regarding Basil's family have on the story? Use **two** details from the story to support your response.