Chapter 5: Science and Curiosity

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Exercise 5.1 — Let us do these activities before we read — Feathered Friend

Q1 Who can a 'feathered' friend be?

SOLUTION

A 'feathered' friend refers to a bird. Birds have feathers, so the phrase is a playful way of describing a bird that someone keeps as a pet or feels fondly about, such as a parrot, canary, or sparrow.

Answer: A bird — any feathered creature kept as a pet or felt close to.

Q2 Which 'feathered' friend do you like? Why?

SOLUTION

Model answer: I like parrots because they are intelligent, colourful, and can mimic human speech. Their ability to learn words and respond to their owners makes them engaging companions. They are also known for their long lifespan, which makes the bond with them lasting.

Answer: Model answer above — adapt with your own preferred bird and reasons.

Q3 If you have a choice between a 'feathered' and a 'furry' friend, who would you choose? Why?

SOLUTION

Model answer: I would choose a feathered friend — a canary — because it requires less space, is quiet most of the time, and its singing is pleasant. A furry friend like a dog needs more care, exercise, and attention.

Alternatively, one could choose a furry friend like a dog for its loyalty and affectionate nature. The choice depends on personal preference, living space, and lifestyle.

Answer: Model answer above — adapt with your own choice and clear reasons.

Q4 Do you think a 'feathered' or a 'furry' friend can accompany astronauts to space? If yes, why? If no, why not?

SOLUTION

A feathered friend could potentially accompany astronauts to space, as shown in the story 'Feathered Friend'. Claribel, a small yellow canary, was brought to the space station because she weighed almost nothing, needed very little food, and

was not troubled by the absence of gravity.

In contrast, a furry friend would pose greater challenges — larger animals need more oxygen, food, and space, and may be distressed by weightlessness.

However, officially, bringing any pet to a space station raises regulatory and safety concerns. The story itself notes there was no rule against it, but it was not standard practice.

Answer: A small feathered friend (like a canary) is more practical in space due to low weight and food needs; a furry friend would pose far greater challenges.

Q5 Complete the vocabulary activity: Fill in the vowels to complete the words using the meanings given alongside. (REGULATION, FORBID, FUSE, ABRUPTLY, CONFESS, DIETITIAN)

SOLUTION

1. official rule that controls how something is done: REGULATION
2. to not allow something: FORBID
3. join or blend to form a single entity: FUSE
4. suddenly: ABRUPTLY
5. admit one's mistake: CONFESS
6. a person who advises what to eat to keep healthy: DIETITIAN

Answer: REGULATION, FORBID, FUSE, ABRUPTLY, CONFESS, DIETITIAN.

Exercise 5.2 — Let us discuss (Part I) — Feathered Friend

Q1 Why did the narrator think Sven had sneaked a bird aboard? What was Sven's scientific reason?

SOLUTION

The narrator suspected Sven had sneaked a bird aboard because one day, while sitting in his office checking technical stores, the narrator heard a musical whistle near his ear. He assumed it came from the station intercom, but instead it continued as a long, involved pattern of melody. Looking up, he saw a small yellow canary — Claribel — hanging motionless in the air. Sven did not confess to owning her for several days, which added to the suspicion that she had been smuggled on board.

Sven's scientific reason was sheer scientific curiosity: he wanted to see how a bird would behave and operate when it had no weight but could still use its wings. Since there is no gravity in space, he was interested in observing a bird's movement in a weightless environment.

Answer: The narrator heard Claribel's song unexpectedly; Sven's scientific reason was curiosity about how a bird would fly with no weight but functioning wings.

Q2 How did Claribel adjust to the new surroundings?

SOLUTION

Claribel adjusted remarkably well to the space station. She was not troubled by the absence of gravity, unlike most animals would have been. When the narrator first saw her, she was hanging motionless in the air like a hummingbird, but with far less effort — her wings were quietly folded at her sides.

She had already learned how to operate in a weightless environment: she did a curious kind of backward loop that no earthbound canary had ever managed, and departed with a few leisurely flicks of her wings. She clearly understood that unnecessary effort was to be avoided.

Over time, Claribel thrived and grew fat, becoming the general pet of the entire crew.

Answer: Claribel adjusted smoothly — she floated motionlessly, mastered backward loops in zero gravity, thrived, and became the crew's general pet.

Q3 What made the narrator mistake the musical whistle for a sound from the intercom?

SOLUTION

The narrator was sitting in his small office checking lists of technical stores when he heard a musical whistle beside his ear. Since he was on a space station where all communication typically came through the station intercom, it was natural for him to assume that the sound had come over the intercom and that an announcement would follow.

He waited for the announcement, but instead the sound continued as a long, involved pattern of melody. That unusual continuation made him look up sharply — causing him to hit his head on an angle beam — and he then saw Claribel for the first time.

Answer: He was in the station and expected all sounds to come over the intercom; the musical whistle seemed like a typical intercom alert before an announcement.

Q4 Do you think the presence of the canary would lead the spacers into trouble? If yes, why? If no, why not?

SOLUTION

Initially, Claribel's presence did risk getting the crew into trouble. There was no official regulation against keeping a pet on the space station, but it was certainly not standard practice. The crew had to actively conceal Claribel whenever VIPs from Earth visited, and there were 'a couple of narrow escapes' when her curious peeps and whistles from ventilating shafts and storage bulkheads had to be explained away quickly.

However, Claribel ultimately proved to be a life-saving presence rather than a source of trouble. When the air purifier froze during a rare eclipse and the single alarm circuit failed to go off, Claribel's collapse alerted the crew to the lack of oxygen in time. Without her, the story tells us, they 'should soon have been slightly dead.'

So while Claribel posed a social and regulatory risk to the crew at first, her presence turned out to be an unexpected safeguard.

Answer: Initially she risked trouble through discovery during VIP visits; ultimately she saved the crew's lives by alerting them to the failing air supply.

Exercise 5.3 — Let us discuss (Part II) — True/False — Feathered Friend

Q1 True or False: The alarm at the space station failed to work properly because they were not connected.

SOLUTION

True. Jim's assistant explained that the second alarm circuit had not been connected up yet. The station had duplicate alarm circuits designed to operate independently, but only one was active. When the air purifier froze during the rare eclipse by Earth's shadow, that single connected alarm failed to go off, leaving the crew with no warning.

Answer: True — the second alarm circuit was not yet connected, so only one circuit was active, and it failed.

Q2 True or False: Claribel was brought to the space station for an official experiment on animal behaviour in space.

SOLUTION

False. Claribel was not brought for any official experiment. Sven smuggled her up on the last ferry from Earth when he returned from leave. His reason was personal and informal: partly out of sheer scientific curiosity, he wanted to observe how a bird would operate when it had no weight but could still use its wings. There was no official sanction or experiment involved.

Answer: False — Sven smuggled her aboard out of personal scientific curiosity, not for any official experiment.

Q3 True or False: The canary's suffering helped the crew discover a problem with the air purifier.

SOLUTION

True. Claribel was found limp and unconscious, which puzzled the crew. While they tried to revive her with oxygen, the narrator's memory was triggered by her condition: he recalled that miners used to carry canaries into mines to warn them of dangerous gas. This led him to realise that there was something wrong with the air in the station. Investigation revealed that the air purifier had partially frozen during a rare eclipse by Earth's shadow.

Answer: True — Claribel's collapse triggered the narrator's memory of miners using canaries as gas detectors, leading them to check and fix the air purifier.

Q4 True or False: The air purifier froze because there was a rare eclipse.

SOLUTION

True. Jim returned with a sheepish expression to explain what had happened: there had been one of their rare eclipses by Earth's shadow that night. Part of the air purifier had frozen up as a result, and the single alarm in the circuit had failed to go off. It was described as 'one of those accidents that couldn't possibly happen.'

Answer: True — a rare eclipse by Earth's shadow caused part of the air purifier to freeze, and the alarm failed to trigger.

Q5 True or False: Claribel could fly gracefully in the space station, performing loops in the air.

SOLUTION

True. When the narrator first saw Claribel, she was hanging motionless in the air with her wings folded. She then did 'a curious kind of backward loop' that the narrator was sure no earthbound canary had ever managed. She had clearly learned to operate in the absence of gravity and moved with a few leisurely flicks of her wings, doing no unnecessary work.

Answer: True — Claribel performed a backward loop and moved gracefully in the zero-gravity environment.

Q6 True or False: The space station crew was uninterested in Claribel and hardly noticed her presence after she was discovered.

SOLUTION

False. Once Claribel was discovered, she became 'a general pet' of the entire crew. Everyone was equally distressed when she was found limp and unconscious. The crew gathered around, discussed what to do, and tried to revive her with oxygen. Her recovery was greeted with 'delighted surprise', and the whole crew participated in the response to her illness. She was clearly beloved by all.

Answer: False — after discovery Claribel became the crew's general pet; they were all distressed when she fell ill and delighted when she revived.

Q7 True or False: Claribel had fainted and had to be revived with oxygen supply.

SOLUTION

True. Sven found Claribel as 'a tiny bundle of yellow feathers, with two clenched claws sticking pathetically up into the air.' Jock Duncan, the cook-doctor-dietitian, could not hear her heartbeat. Someone suggested giving her a shot of oxygen, and she was tucked into a face mask that served as an oxygen tent. She revived at once, hopped onto Sven's finger, and sang — but then promptly keeled over again until the air problem was fixed.

Answer: True — Claribel was found unconscious and was revived by placing her in an oxygen face mask.

Exercise 5.4 — Let us think and reflect (Extract I) — Feathered Friend

Q1 Extract: 'Sven was one of our best construction men, and excelled at the tricky and specialised work of collecting assorted girders as they floated around in free fall, making them do the slow-motion, three-dimensional ballet that would get them into their right positions, and fusing the pieces together when they were precisely dovetailed into the intended pattern: it was a skilled and difficult job, for a space suit is not the most convenient of garbs in which to work.' (i) What can be inferred about Sven's abilities from his job description? (ii) How can we conclude that Sven was working in zero gravity? (iii) Assertion-Reason: (A) Sven's job required him to make girders perform a 'three-dimensional ballet' in space. (R) Working in zero gravity allows objects to float, making precise positioning more challenging. Select the correct option. (iv) Replace the underlined word 'garbs' with a word similar in meaning from the extract. 'During the festival, people wore colourful outfits that represented their culture.'

SOLUTION

(i) From the extract, we can infer that Sven was highly skilled, patient, and capable of working with great precision in a challenging environment. He had a strong understanding of how objects behave in zero gravity and could manoeuvre floating girders into exact positions before fusing them. He excelled at intricate, three-dimensional spatial work — abilities that go far beyond ordinary construction skills.

Correct answer: B. He possesses a strong understanding of working in space.

(ii) We can conclude Sven was working in zero gravity because the text describes the girders 'floating around in free fall' and Sven making them do a 'slow-motion, three-dimensional ballet' to get them into the right positions. Objects float and drift in zero gravity, which is exactly what the description shows. Also, the text mentions that Sven's team 'could step back and admire their handiwork without being abruptly parted from it by gravity' — confirming the absence of gravitational pull.

(iii) Correct answer: A. Both (A) and (R) are true, and (R) is the correct explanation of (A). The girders floated in zero gravity and had to be guided precisely into position — this is why the job required the skill of a 'three-dimensional ballet'. Zero gravity allowing objects to float is exactly what made precise positioning more challenging and necessitated that ballet-like control.

(iv) The word similar in meaning to 'garbs' (clothing of a special kind) from the extract is 'outfits'. The sentence becomes: 'During the festival, people wore colourful garbs that represented their culture.'

Answer: (i) B — strong understanding of working in space. (ii) Girders float in free fall; crew can step back without gravity parting them. (iii) A — both true, R correctly explains A. (iv) garbs.

Exercise 5.5 — Let us think and reflect (Extract II) — Feathered Friend

Q1 Extract: '"Jim!" There's something wrong with the air! That's why Claribel's passed out. I've just remembered that miners used to carry canaries down to warn them of gas.' 'Nonsense!' said Jim. 'The alarms would have gone off. We've got duplicate circuits, operating independently.' 'Er—the second alarm circuit isn't connected up yet,' his assistant reminded him. That shook Jim; he left without a word, while we stood arguing and passing the oxygen bottle around like a pipe of peace. (i) Fill in the blank: The narrator references canaries and miners in order to _____. (ii) Complete: Jim initially dismisses the warning about the air because _____. (iii) What does 'shook Jim' mean? (iv) What does passing the oxygen bottle around 'like a pipe of peace' suggest?

SOLUTION

(i) The narrator references canaries and miners in order to highlight the historical use of canaries as warning systems. Miners used to carry canaries into underground mines because canaries are extremely sensitive to toxic gases like carbon monoxide. If the canary fell unconscious or died, it was a warning to the miners to evacuate. The narrator connects Claribel's collapse to this same principle — she was warning them about the failing air in the station.

(ii) Jim initially dismisses the warning about the air because he was confident the duplicate alarm circuits would have detected any air problem and gone off. He believed the system was foolproof with two independent circuits operating separately, so he assumed the air must be fine.

(iii) Correct answer: B. Jim was startled by unexpected information. The phrase 'shook Jim' means he was suddenly disturbed or unsettled upon learning that the second alarm circuit had not been connected yet — the very backup he had relied on for his dismissal of the warning did not exist.

(iv) The crew's action of passing the oxygen bottle around 'like a pipe of peace' suggests that in the face of potential danger, they set aside argument and disagreement and shared the available resource calmly and cooperatively. The comparison to a 'pipe of peace' — a symbol of truce and reconciliation — implies that the oxygen became a source of comfort and unity, temporarily stopping the argument and bringing the crew together in a quiet, shared moment of precaution.

Answer: (i) highlight the historical use of canaries as warning systems. (ii) he believed the duplicate alarm circuits would have triggered. (iii) B — startled by unexpected information. (iv) They set aside argument and shared the resource cooperatively, finding calm and unity in the face of danger.

Exercise 5.6 — Let us think and reflect (Long answers) — Feathered Friend

Q1 What was the purpose of the alarm? What had caused its failure?

SOLUTION

The purpose of the alarm was to warn the crew of the space station if the air supply became dangerously compromised. The station had duplicate alarm circuits designed to operate independently, so that if one failed, the other would still trigger.

The failure was caused by a combination of factors. During one of their rare eclipses by Earth's shadow, part of the air purifier froze up. This led to a deterioration in the air quality. However, the single alarm circuit that was connected at the time failed to go off. The second alarm circuit had not yet been connected, so there was no backup. As Jim's engineer said, it was 'one of those accidents that couldn't possibly happen' — half a million dollars' worth of chemical and electronic engineering had completely let them down.

Answer: The alarm was meant to warn of air supply failure; it failed because the air purifier froze during an eclipse, the one connected circuit malfunctioned, and the second circuit was not yet connected.

Q2 How does the crew's reaction to Claribel change over the course of the story?

SOLUTION

At the beginning, Claribel's presence on the space station was a secret. Sven had smuggled her aboard without informing anyone, and for several days he did not confess to her ownership. Once she was discovered, the crew's reaction was one of acceptance rather than hostility — she quickly became a 'general pet', loved by all.

The crew showed concern when they had to conceal Claribel from visiting VIPs, and thought quickly to explain her unexpected sounds. This showed a protective attitude toward her.

When Claribel was found unconscious, everyone was 'equally distressed.' The crew worked together to revive her with oxygen, and there was 'delighted surprise' when she recovered — showing deep affection.

By the end of the story, after Claribel had saved their lives, the crew's attitude had transformed into one of gratitude and respect. The narrator implies that having a

canary on a space station is not just tolerated but actively desirable — it provides a double safeguard at practically no extra expense.

Answer: The crew moved from tolerant acceptance → affectionate attachment → deep distress at her illness → gratitude after she saved their lives.

Q3 What does the last part of the story tell us about the significance of unusual ways of problem solving?

SOLUTION

The last part of the story highlights that the most sophisticated technology can fail, and that simple, unconventional methods can sometimes be the most effective safeguards.

Half a million dollars' worth of chemical and electronic engineering failed the crew completely — the alarm systems, which were supposed to protect them, did not work. It was Claribel, a small canary who had been smuggled aboard unofficially, who saved their lives by alerting them through her collapse.

This echoes an old, simple practice: miners used canaries as natural gas detectors because the birds were more sensitive to toxic gases than humans. The story suggests that old wisdom and unconventional solutions should not be dismissed in favour of complex technology.

The narrator's closing remark — that anyone visiting a space station who hears birdsong should be reassured rather than alarmed, because it means they are 'doubly safeguarded, at practically no extra expense' — reinforces this message. Thinking outside the box and valuing simple biological sensitivity alongside technology can make critical systems more robust.

Answer: Even the most advanced technology can fail; old, unconventional methods (like a canary as a gas detector) can succeed where expensive engineering cannot — creative, simple solutions complement complex ones.

Q4 Justify the appropriateness of the title of the story.

SOLUTION

The title 'Feathered Friend' is highly appropriate on multiple levels.

On a literal level, 'feathered friend' refers to Claribel, the yellow canary. Birds are commonly called 'feathered friends' because of their feathers, and Claribel was

indeed a friend to the crew — first as a pet and source of joy, and then as a life-saving alarm.

On a deeper level, 'feathered friend' captures the warmth and affection the crew came to feel for Claribel. She was smuggled aboard out of curiosity, became the general pet, was grieved over when she fell ill, and was cherished after she saved their lives.

The title also carries irony: in serious scientific and technological settings, a 'feathered friend' seems out of place, yet it is precisely this unlikely companion who proves to be the most important safety device on the station.

Additionally, 'friend' emphasises the bond between humans and animals, which is at the heart of the story. The title therefore perfectly blends the personal warmth of the relationship with the larger theme of nature and science working together.

Answer: The title is appropriate literally (Claribel is a bird/pet), emotionally (she is truly a friend to all), and ironically (the least scientific thing on the station becomes its most vital safety device).

Q5 'Without Claribel, we should soon have been slightly dead.' What does this line suggest about uncertainty of life in space?

SOLUTION

This line, delivered with characteristic understatement, powerfully underscores the precariousness of life in a space station.

In space, humans are entirely dependent on technology — air purifiers, alarm systems, and other engineering — to survive. The phrase 'slightly dead' is ironic and humorous, because death is absolute, not slight. This understated wording highlights how the crew had grown casual about the dangers around them.

The line suggests that in space, life can end suddenly and without warning, through a failure of systems that seemed reliable. The most sophisticated and expensive technology can malfunction, and there may be no second chance. The crew came within a narrow margin of dying — not from an accident or dramatic event, but from a mundane equipment failure caused by an eclipse.

It also suggests that uncertainty in space demands redundancy and creativity in safety measures. The official alarm system failed; an unofficial canary succeeded. Life in space is fragile and dependent on vigilance from unexpected sources.

Answer: Life in space is utterly dependent on technology that can fail without warning; the line — delivered with dark humour — stresses how thin the margin between life and death is when any single system breaks down.

Q6 Explain how has the writer presented science fiction with a touch of humour.

SOLUTION

Arthur C. Clarke blends science fiction and humour seamlessly throughout the story.

The science fiction elements include: a space station in orbit, construction workers in space suits assembling girders in zero gravity, a bird flying in weightlessness, and sophisticated alarm systems and air purifiers. These give the story its futuristic setting.

The humour is introduced through the narrator's dry, understated tone. For example:
— 'Don't ask me why Sven wanted a pet, or why he chose the one he did. I'm not a psychologist' — a comic deflection.
— The crew having to 'think fast' to explain Claribel's peeps and whistles to VIPs is presented as a minor comic inconvenience.
— The narrator bumping his head on an angle beam while startled by Claribel's song adds physical comedy.
— Jim returning with 'a sheepish expression' after confidently declaring there was no problem is comic irony.
— The phrase 'Without Claribel, we should soon have been slightly dead' is darkly comic understatement.
— The final suggestion that birdsong in a space station means you're 'doubly safeguarded, at practically no extra expense' has a wry, tongue-in-cheek quality.

Clarke uses this gentle humour to make the science fiction scenario feel human and relatable, while also highlighting the absurdity of advanced technology failing where a small bird succeeded.

Answer: Clarke sets a futuristic space station but narrates with dry wit and understatement — comic incidents (head-bump, sheepish engineer, 'slightly dead'), ironic observations, and a canary outwitting expensive engineering all blend SF with gentle humour.

Q7 How would Sven reflect on his experience of almost losing Claribel and for saving the lives of the entire crew?

SOLUTION

Model answer (Sven's perspective):

Sven would likely reflect on the experience with a mixture of guilt, relief, and pride.

He would feel guilty that his decision to bring Claribel aboard — without official permission — had put her in danger. Watching her lie limp and motionless in his hand, her tiny claws clenched, must have been deeply distressing for him. The thought that she might have died because of the very journey he had taken her on would weigh on him.

At the same time, Sven would feel immense relief — both that Claribel survived and that the crew's lives were saved. His act of curiosity, initially seen as an eccentric smuggling of a pet, had turned out to be an act of providence. Without Claribel's collapse alerting the narrator to the failing air, the entire crew might have died quietly in their sleep.

Finally, Sven would feel a quiet pride — not in himself exactly, but in Claribel, and in the vindication of his scientific curiosity. He had wanted to observe how a bird behaved in zero gravity. Instead, Claribel had demonstrated something far more profound: the value of simple biological sensitivity as a safeguard against the failure of complex machines.

Answer: Model answer above — adapt as needed. Sven would feel guilt (he put Claribel at risk), relief (both she and the crew survived), and quiet pride in the vindication of his scientific curiosity.

Exercise 5.7 — Let us learn — Adjectives + Merged Words + Future Tense — Feathered

Q1 Choose the appropriate adjectives from the box (nagging, vague, delighted, narrow, sluggish, hushed, inexplicable, sheepish) to match with the words 1–8: (1) path, (2) worry, (3) plan, (4) look, (5) reason, (6) traffic, (7) voices, (8) expression.

SOLUTION

1. narrow path
2. nagging worry
3. vague plan
4. sheepish look
5. inexplicable reason
6. sluggish traffic
7. hushed voices
8. delighted expression

Answer: 1-narrow, 2-nagging, 3-vague, 4-sheepish, 5-inexplicable, 6-sluggish, 7-hushed, 8-delighted.

Q2 Combine the word pairs to make merged words and give their meanings: (ii) motor + hotel, (iii) smoke + fog, (iv) situation + comedy, (v) video + log, (vi) spoon + fork, (vii) web + seminar.

SOLUTION

(ii) motel — a roadside hotel designed for motorists, with parking near the rooms.
(iii) smog — a type of dense, dirty fog caused by smoke and pollution.
(iv) sitcom — a situation comedy; a television series based on humorous everyday situations.
(v) vlog — a video log or blog in which the content is primarily in video format.
(vi) spork — a utensil with the features of both a spoon and a fork.
(vii) webinar — a seminar or workshop conducted over the internet.

Answer: (ii) motel, (iii) smog, (iv) sitcom, (v) vlog, (vi) spork, (vii) webinar.

Q3 Read: 'It will mean that you're being doubly safeguarded.' 'will' denotes _____ (past/present/future) time. Then fill in the blanks with the correct future form: 1. Our flight _____ (leave) at 10.00 a.m. tomorrow. 2. They _____ (finish) the project by the end of this week. 3. The weather forecast says it _____ (rain) later today. 4. We _____ (move) into our new house next month. 5. I _____ (start) my new hobby class next Monday. 6. She _____ (go) to the mall this afternoon. 7. The team _____ (have) a meeting at 3.00 p.m. tomorrow. 8. I _____ (help) you with your homework after dinner.

SOLUTION

'will' in 'It will mean that you're being doubly safeguarded' denotes future time.

1. Our flight leaves at 10.00 a.m. tomorrow. (Simple Present — scheduled timetable)
2. They will have finished the project by the end of this week. (Future Perfect — completed by a point in time)
3. The weather forecast says it is going to rain later today. (going to — prediction based on evidence/forecast)
4. We are moving into our new house next month. (Present Progressive — personal fixed plan)
5. I am starting my new hobby class next Monday. (Present Progressive — personal fixed arrangement)
6. She is going to the mall this afternoon. (Present Progressive — personal arrangement)
7. The team has a meeting at 3.00 p.m. tomorrow. (Simple Present — scheduled/planned event)
8. I will help you with your homework after dinner. (will — offer/promise expressing willingness)

Answer: 'will' = future. 1-leaves, 2-will have finished, 3-is going to rain, 4-are moving, 5-am starting, 6-is going, 7-has, 8-will help.

Q4 Fill in the blanks with suitable future forms of verbs in brackets for the AI passage: By 2040, artificial intelligence 1._____(revolutionise) medical treatments. Researchers 2._____(develop) AI-powered diagnostic tools that 3._____(transform) healthcare by the end of this decade. Next week, the International Science Congress 4._____(open) to showcase advancements. In the coming years, robots 5._____(assist) surgeons. Years ago, experts had predicted that AI would reshape our world, and now, as we approach the future, this 6._____(be) our new reality.

SOLUTION

1. will have revolutionised — Future Perfect (completed by 2040, a specific future time).
2. will develop — will (general future prediction about researchers).
3. will transform — will (general future prediction).
4. opens — Simple Present (scheduled event on a fixed date: next week).
5. will assist — will (general future prediction for the coming years).
6. will be — will (future certainty/prediction as we approach that time).

Answer: 1-will have revolutionised, 2-will develop, 3-will transform, 4-opens, 5-will assist, 6-will be.

Exercise 5.8 — Let us speak — Feathered Friend

Q1 Read the words aloud and circle the silent letters: ballet, alarm, whistle, psychologist, receipt, debris, pneumonia, island, wreck, aisle, almond, campaign, foreign, fasten.

SOLUTION

ballet — silent 't' (ba-lay)
alarm — silent 'r' (uh-laam)
whistle — silent 't' (wi-sl)
psychologist — silent 'p' (sai-ko-luh-juhst)
receipt — silent 'p' (ruh-seet)
debris — silent 's' (duh-bree)
pneumonia — silent 'p' (nyoo-moh-nyuh)
island — silent 's' (eye-luhnd)
wreck — silent 'w' (rek)
aisle — silent 's' (eye-l)
almond — silent 'l' (aa-mund)
campaign — silent 'g' (kam-payn)
foreign — silent 'g' (for-in)
fasten — silent 't' (faa-suhn)

Answer: Silent letters: ballet-t, alarm-r, whistle-t, psychologist-p, receipt-p, debris-s, pneumonia-p, island-s, wreck-w, aisle-s, almond-l, campaign-g, foreign-g, fasten-t.

Q2 Work in pairs. Use the situations to ask for and give suggestions: (a) making a model of the solar system for the Science Exhibition; (b) preparing for the inter-class quiz on Chandrayaan-3.

SOLUTION

Model dialogue (a) — Solar System Model:
Student A: What should I use to make a model of the solar system for the Science Exhibition?
Student B: I feel you should use thermocol balls of different sizes to represent the planets. Paint them in the right colours.
Student A: How can I make sure the distances look right?
Student B: It is best to use a long strip of cardboard as the base and mark the planets at scaled distances. You can use thread to hang them.

Model dialogue (b) — Chandrayaan-3 Quiz:

Student A: How can I prepare for the inter-class quiz on Chandrayaan-3?

Student B: You should ensure you know the mission's objectives, the names of the modules (Vikram lander and Pragyan rover), and the landing date (23 August 2023).

Student A: What are the best ways to remember the facts?

Student B: If you have an issue remembering dates, try making flashcards. It is good to prepare yourself by reading ISRO's official website and watching news clips.

Answer: Model answer above — adapt with your own ideas using the prompt phrases for asking and giving advice.

Exercise 5.9 — Let us write — Article on The Importance of Internet — Feathered Friend

Q1 Write an article titled 'The Importance of Internet' using the social media web of internet uses. (Format: Heading/Title, Name of writer, Para 1: introduction, Para 2: uses and importance with examples, Para 3: concluding comment with thoughtful idea/quote.)

SOLUTION

THE IMPORTANCE OF INTERNET

By [Your Name]

In the twenty-first century, the internet has transformed from a luxury into a necessity. It connects billions of people across the globe, making the world a smaller, more accessible place. Whether for education, communication, entertainment, or business, the internet has woven itself into the fabric of everyday life.

The internet serves a wide range of essential purposes. In education, it provides access to vast repositories of knowledge — from NCERT e-textbooks to online courses on platforms like DIKSHA and Khan Academy. Students can research topics, attend virtual classes, and collaborate with peers across cities. In communication, tools like email, video calls, and social media allow people to stay connected with family and friends instantly, regardless of distance. For business, the internet enables e-commerce, digital payments, and remote working, creating opportunities that did not exist before. Even in healthcare, patients can consult doctors online and access reliable medical information in emergencies.

The internet, like any powerful tool, must be used responsibly. As Tim Berners-Lee, the inventor of the World Wide Web, said: 'The web is more a social creation than a technical one.' It is a mirror of human society — capable of great good if guided wisely. Used thoughtfully, the internet empowers every individual to learn, connect, and contribute to the world.

Answer: Model answer above — adapt as needed.

Exercise 5.10 — Let us explore — Feathered Friend

Q1 The phrase 'a canary in the coal mine' describes early signs of potential danger. Coal miners in places like Arunachal Pradesh used canary birds to detect carbon monoxide. How does the story 'Feathered Friend' illustrate this concept?

SOLUTION

The story 'Feathered Friend' is a direct illustration of this concept transplanted into the future. In the story, Claribel the canary collapsed when the air purifier on the space station failed during a rare eclipse. The crew's alarm system did not work — the second circuit was unconnected and the first failed — but Claribel, being more sensitive to changes in air quality, was affected before the humans noticed anything wrong.

Just as miners carried canaries into underground tunnels to detect toxic gases (since the birds would succumb first, giving miners time to escape), Claribel served as a biological early-warning system in the space station. Her collapse prompted the narrator to recall the miners' practice and alert the crew to the air problem, saving all their lives.

The phrase 'a canary in the coal mine' is therefore literally and thematically at the heart of the story — an old, humble biological practice proving more effective than half a million dollars' worth of electronic engineering.

Answer: Claribel collapses first when air quality fails (just as coal mine canaries did), alerting the crew before they feel any effects — a futuristic retelling of the 'canary in the coal mine' concept.

Q2 Read how astronauts manage routine tasks in space without gravity: Write, Exercise, Eat, Sleep. Share what you find most surprising and why.

SOLUTION

The four facts about astronaut life in space are fascinating:
— Write: A special Space Pen with resin-combined ink that liquefies only through friction with the ball point; works in extreme temperatures, all positions, and even in vacuum.
— Exercise: Resistance equipment using vacuum cylinders for weight training; running on treadmills while strapped down with rubber bands.
— Eat: Preserved foods — dried, canned, vacuum-packed, or frozen —

rehydrated with cold or hot water; some heated in an oven; ready-to-eat items like nuts, bread, and fruit.
— Sleep: Astronauts can sleep on any surface (floor, wall, ceiling) since there is no up or down, but must restrain themselves in sleeping bags or small compartments to avoid floating away.

Most surprising: The fact that a Space Pen had to be specially engineered just to write in space — a task so ordinary on Earth — highlights how every single human activity must be redesigned from scratch in the absence of gravity. This underscores the extraordinary engineering effort behind every aspect of space life.

Answer: Model answer above — adapt with your own most surprising fact and reasoning.

Q3 Animals can sense natural calamities. Read the examples (tsunamis, earthquakes, storms) and discuss whether this is true, based on the scientific explanation given.

SOLUTION

The text provides compelling evidence that animals can indeed sense natural calamities before humans can detect them. Before the 2004 Indonesian tsunami, elephants ran for higher ground, flamingos abandoned low-lying nesting areas, and dogs refused to go outdoors — all before the wave struck. Before the Naples quake of 1805, oxen, sheep, dogs, and geese made alarm calls together. Migratory birds dodge Pacific storms, and sharks and dolphins swim away from hurricane-prone areas before the storms arrive.

The scientific explanation provided is that when severe stress builds in deep rock before an earthquake, ultra-low frequency electromagnetic waves are generated. Animals are able to sense these waves, which humans cannot perceive. This gives animals an early-warning advantage.

This evidence strongly supports the idea that animals have heightened biological sensitivities that can serve as natural early-warning systems — much like Claribel in the story. Studying animal behaviour during unusual events could potentially help scientists develop better disaster prediction systems.

Answer: Yes — scientific evidence and examples confirm it: animals detect ultra-low frequency electromagnetic waves from rock stress before quakes, and other physical signals before storms and tsunamis.

Exercise 5.11 — Let us do these activities before we read — Magnifying Glass

Q1 What is common in all the pictures (showing people using magnifying glasses)?

SOLUTION

All the pictures show people using a magnifying glass — a circular lens with a handle — to look at objects more closely. The common element is the act of magnification: making small or distant objects appear larger and more detailed to the naked eye. In each case, the magnifying glass helps the person observe something they could not see clearly without it.

Answer: All show the use of a magnifying glass to observe objects more closely and in greater detail.

Q2 Why do you think the people in the pictures need to use a magnifying glass?

SOLUTION

The people in the pictures need a magnifying glass for different reasons depending on the activity: a scientist or researcher uses it to examine tiny specimens like insects or plant cells; a reader with low vision uses it to see small print; a jeweller uses it to inspect gems or fine workmanship; a detective uses it to study small clues at a crime scene. In all cases, the purpose is to enlarge small details that would otherwise be missed by the naked eye.

Answer: They need it to enlarge details too small to see clearly with the naked eye — for scientific examination, reading, jewellery work, or detecting fine clues.

Q3 If you have a magnifying glass, what would you like to use it for and why?

SOLUTION

Model answer: I would like to use a magnifying glass to examine insects and spiders up close. I have always been curious about the intricate structure of a spider's web and its spinnerets — exactly what the poet in 'Magnifying Glass' describes. Seeing the tiny claws of a spider or the compound eyes of a fly magnified would be like discovering a hidden world that exists all around us without our awareness. A magnifying glass would transform my ordinary garden into a universe of microscopic wonders.

Answer: Model answer above — adapt with your own choice and reason.

Exercise 5.12 — Let us discuss — Magnifying Glass (poem)

Q1 Complete the summary: The poem describes the magic of seeing the world through a 1._____. It reveals how tiny things like 2._____ and 3._____ can appear vast and complex. Even a 4._____ of water can seem like a hive of 5._____. The poet is impressed at how the spider spins its 6._____ from its 7._____. The poem ends with the idea that, through lenses, the 8._____ could seem within reach.

SOLUTION

1. magnifying glass (or 'round glass')
2. chalk (or shells in chalk)
3. moss
4. drop
5. bees
6. woven web-silk (or web)
7. spinnerets
8. moon

Answer: 1-magnifying glass, 2-chalk/shells, 3-moss, 4-drop, 5-bees, 6-woven web-silk, 7-spinnerets, 8-moon.

Q2 Fill in the blanks: 1. The main idea of the poem is the transformative power of _____ (wonders in nature/close observation) through the magnifying glass. 2. The tone of the poem is _____ (wonder and curiosity/peaceful and emotional). 3. The poem has _____ stanzas with _____ lines in each stanza. Hence, it is a quatrain. (four; six/six; four) 4. The rhyme scheme of the poem is _____. (ABCD; ABCB)

SOLUTION

1. close observation — The poem's main idea is the transformative power of close observation. The magnifying glass enables the speaker to see extraordinary detail in ordinary objects, showing that careful, magnified observation reveals wonders hidden from the naked eye.
2. wonder and curiosity — The tone is one of wonder and curiosity. The speaker is filled with excitement and amazement at what the magnifying glass reveals — from myriad shells in chalk to the spider's tigerish claws.
3. The poem has six stanzas with four lines in each stanza. Hence, it is a

quatrain.

4. The rhyme scheme is ABCB — the second and fourth lines of each stanza rhyme, while the first and third lines do not.

Answer: 1-close observation, 2-wonder and curiosity, 3-six stanzas with four lines each (quatrain), 4-ABCB.

Q3 Pick examples from the poem for: 1. Simile, 2. Alliteration, 3. Metaphor.

SOLUTION

1. Simile: 'A drop of water / Like hive of bees' — the drop of water magnified is compared to a hive of bees using the word 'like'.

2. Alliteration: 'The tigerish claws he has!' — repetition of the consonant sound is present (there is also 'flowers and trees' — the repeated 'f' in 'of but an inch of' and 'forest—flowers'). The clearest example is 'spinnerets' following 'spider' and 'silk' — the repeated 's' sounds throughout stanza 2: 'spider jets / The woven web-silk / From his spinnerets' (s-j-w-s-s).

3. Metaphor: 'I can make Magic talk' — the magnifying glass is metaphorically described as something that makes 'Magic talk', meaning it reveals hidden wonders and speaks the language of nature. The magnifying glass is itself implicitly a metaphor for the power of observation and science.

Answer: 1-Simile: 'A drop of water / Like hive of bees'. 2-Alliteration: repeated 's' sounds in 'spider…web-silk…spinnerets' (or 'forest—flowers'). 3-Metaphor: 'I can make Magic talk'.

Q4 Visual imagery: 1. In 'A myriad shells show in a scrap of chalk', the magnifying glass reveals _____. 2. In 'A forest—flowers and trees' the poet uses the imagery of nature to emphasise _____.

SOLUTION

1. In the line 'A myriad shells show in a scrap of chalk', the magnifying glass reveals the countless tiny shell fragments — fossils of microscopic marine organisms — embedded in a small piece of chalk. What appears to be a plain, dull white scrap becomes a rich record of ancient sea life when magnified.

2. In the line 'A forest—flowers and trees', the poet uses the imagery of a forest to emphasise how a tiny patch of moss, when magnified, looks as complex, dense, and rich as a full-sized forest with its intricate miniature flowers and tree-like

structures. The imagery stresses the extraordinary complexity hidden in ordinary, overlooked objects.

Answer: 1. Countless tiny shell fossils embedded in chalk — a scrap reveals a whole ancient sea. 2. The moss magnified appears as densely complex as a forest — emphasising hidden grandeur in the miniature.

Q5 Complete the sentences with a reason: 1. The poet uses exclamation marks in 'The tigerish claws he has!', 'With all those eyes!' and 'In an afternoon!' because it _____. 2. In 'Magic talk' the poet uses personification because it _____. 3. The repetitive pattern of introducing an ordinary object then describing extraordinary magnified detail supports the theme of _____ as the speaker reveals _____. 4. In the final stanza the poet shifts from small everyday objects to the moon because _____.

SOLUTION

1. The poet uses exclamation marks in those lines because they convey the speaker's sense of shock, wonder, and delight at what the magnifying glass reveals. The exclamation marks reflect an emotional outburst — the tigerish claws of the spider are startling, the multiple eyes of the fly are astonishing, and the idea that the moon could seem reachable in an afternoon is thrillingly fanciful. The punctuation makes the reader feel the speaker's sudden, spontaneous excitement.

2. In the phrase 'Magic talk', the poet uses personification to describe the magnifying glass because it gives the glass a human ability — the power of speech. The glass is presented as something that 'makes Magic talk', meaning it reveals secrets and wonders that were silent and invisible before. By personifying the glass as a communicator, the poet elevates it from a mere tool to a revealer of hidden truths.

3. The repetitive pattern supports the theme of the transformative power of close observation, as the speaker reveals the extraordinary wonders concealed within ordinary, everyday objects — showing that nothing is truly ordinary when looked at closely enough.

4. In the final stanza, the poet shifts from small everyday objects to the moon because he wants to extend the magnifying glass's power from the miniature to the cosmic. Having shown that tiny things (chalk, moss, a water drop, a spider)

contain vast worlds when magnified, the poet suggests that even the great and distant — the moon — can be brought close by lenses. The shift signals that the principle of observation and magnification has no limits: what seems impossibly far away can be made to feel within reach. It ends the poem on an inspiring, expansive note.

Answer: 1. Exclamation marks convey the speaker's sudden wonder and delight. 2. Personification presents the glass as a revealer/communicator of hidden truths. 3. Theme: transformative power of close observation; reveals extraordinary detail in ordinary objects. 4. To show observation has no limits — lenses can bring even the distant moon within reach.

Exercise 5.13 — Let us think and reflect (Extract I) — Magnifying Glass

Q1 Extract: 'With this round glass / I can make Magic talk— / A myriad shells show / In a scrap of chalk; / Of but an inch of moss / A forest—flowers and trees;' (i) True or False: The poet uses his magical powers to make the round glass powerful. (ii) Select the line from the extract that expresses the presence of intricate patterns in ordinary objects. (iii) What does 'an inch of moss' compared to 'a forest' suggest about the speaker's view through the magnifying glass? (iv) How does the poet feel about the magnifying glass's ability to reveal hidden wonders?

SOLUTION

(i) False. The poet does not use magical powers. 'Magic talk' is a metaphor — the magnifying glass itself is said to 'make Magic talk', meaning it reveals the hidden wonders of the natural world through the scientific principle of magnification. The power lies in the lens, not in any supernatural ability of the poet.

(ii) The line 'A myriad shells show / In a scrap of chalk' best expresses the presence of intricate patterns in ordinary objects. It reveals that what looks like a plain scrap of chalk actually contains countless tiny shell structures — intricate patterns invisible to the naked eye.

(iii) The comparison of 'an inch of moss' to 'a forest' suggests that through the magnifying glass, even the smallest patch of ordinary moss is revealed to be as rich, complex, and layered as an entire forest. The speaker's view through the glass transforms the mundane and overlooked into something vast and wondrous. It suggests that the magnifying glass changes one's entire perception of scale and the richness of the natural world.

(iv) Correct answer: B. Fascinated. The poet is fascinated by the magnifying glass's ability to reveal hidden wonders. His language — 'Magic talk', 'marvellous', exclamation marks — all reflect a deep sense of fascination and awe at the transformations the lens produces.

Answer: (i) False — 'Magic talk' is a metaphor for the lens's power, not the poet's. (ii) 'A myriad shells show / In a scrap of chalk'. (iii) Through the glass even a tiny inch of moss is as complex as a whole forest — scale transforms. (iv) B — Fascinated.

Exercise 5.14 — Let us think and reflect (Long answers) — Magnifying Glass

Q1 What is the significance of the spider in the poem?

SOLUTION

The spider is one of the most vivid and significant images in the poem. Through the magnifying glass, the speaker observes the spider in extraordinary detail: its 'deft' movements as it 'jets' silk from its spinnerets to weave its web, and most strikingly, its 'tigerish claws'.

The spider is significant on several levels. First, it demonstrates the transformative power of the magnifying glass: what appears to be a small, familiar creature reveals, under magnification, a fearsome, tiger-like predator with sharp claws and multiple eyes. The spider becomes simultaneously more magnificent and more terrifying.

Second, the spider represents the complexity hidden in nature. Even a common garden spider — often ignored or feared — is revealed to be a skilled engineer, weaving precise silk structures. The reference to the 'silly flies' that stumble into its net with 'all those eyes' — their many compound eyes being no protection — adds dark humour and irony.

Third, the spider embodies the poem's central theme: that close observation reveals wonders invisible to the naked eye. The spider is a symbol of the hidden world that magnification unlocks.

Answer: The spider shows that magnification reveals a fearsome predator in a familiar creature, illustrates nature's hidden complexity, and embodies the poem's theme that close observation transforms the ordinary into the extraordinary.

Q2 How might the speaker's view of the natural world change if there was no use of a magnifying glass?

SOLUTION

Without the magnifying glass, the speaker would see the natural world only at face value — ordinary, unremarkable, and familiar. A scrap of chalk would be just a dull white fragment, not a repository of ancient shell fossils. An inch of moss would be a plain green patch, not a dense forest of miniature flowers and trees. A drop of water would be just that — a drop — not a hive teeming with microscopic life.

The spider would be just a small, common creature in its web, not the fascinating predator with tigerish claws and silk-spinning spinnerets that the glass reveals.

In short, without the magnifying glass, the speaker would live in a flattened, less wondrous version of the world. The poem suggests that human perception is limited by the naked eye, and that tools of observation — from the magnifying glass to the telescope — expand the boundaries of what we can perceive and appreciate. The natural world is infinitely rich, but we need the right tools to access that richness.

Answer: Without the glass, the speaker would see only the surface — chalk, moss, a water drop — missing the hidden worlds within; perception would be flat and the natural world far less wondrous.

Q3 Why does the poem end with the idea of the moon being within reach?

SOLUTION

The poem ends with the moon as a deliberate climax and culmination of its central theme. Throughout the poem, the magnifying glass has progressively revealed hidden worlds in smaller and smaller things — chalk, moss, a water drop, a spider. By the final stanza, the poet extends this logic outward: if a tiny lens can make the microscopic appear vast, then a larger lens — a telescope — can make the vastly distant appear near.

The closing lines — 'Yes, and with lenses like it, / Eyeing the moon, / 'Twould seem you'd walk there / In an afternoon!' — suggest that the same principle of magnification that reveals the miniature can also conquer distance. The moon, which is 384,400 kilometres away, can feel close enough to walk to in an afternoon through the right lens.

The ending is also thematically resonant: it moves from the small (chalk, moss) to the cosmic (the moon), implying that science and curiosity know no limits. The magnifying glass becomes a symbol not just of a tool, but of humanity's ambition to explore and understand both the infinitely small and the infinitely large.

Answer: The moon ending elevates the magnifying glass from a tool for the tiny to a symbol of limitless exploration — the same lenses that reveal microscopic worlds can bring even the distant moon within reach, suggesting science has no boundaries.

Q4 What is the speaker's attitude towards nature and the act of observation?

SOLUTION

The speaker's attitude towards nature is one of deep curiosity, wonder, and reverence. He does not see the natural world as merely a backdrop to human life but as an endlessly fascinating subject for close study. He 'lies in wait' to watch the spider — a phrase that suggests patient, dedicated observation, almost like a scientist or naturalist.

He is filled with genuine excitement at what observation reveals: exclamation marks punctuate his discoveries ('The tigerish claws he has!', 'With all those eyes!'), expressing spontaneous delight.

Towards the act of observation, the speaker is enthusiastic and celebratory. He believes that close observation transforms the ordinary into the marvellous — a scrap of chalk, a drop of water, an inch of moss are all worthy of careful attention. He sees the magnifying glass not as a scientific instrument but as a means of unlocking 'Magic'.

The speaker's attitude suggests that the world rewards those who look carefully, and that curiosity is the first step toward understanding.

Answer: The speaker is curious, patient, and filled with wonder — he sees careful observation as a way to unlock hidden magic in nature, and celebrates both the natural world and the scientific tools that reveal it.

Q5 Which is your favourite part of the poem? Why?

SOLUTION

Model answer: My favourite part is stanza three — 'I lie in wait and watch / How the deft spider jets / The woven web-silk / From his spinnerets; / The tigerish claws he has! / And oh! the silly flies / The stumble into his net— / With all those eyes!' — because it is the most dramatic and surprising moment in the poem.

The image of the spider as a patient, skilled hunter with 'tigerish claws' completely transforms how I think about an ordinary garden spider. The dark irony of flies with 'all those eyes' still stumbling into the web is both funny and a little unsettling. The poet's tone shifts from gentle wonder to something more intense and even fearful in these lines. It shows how a familiar creature, seen clearly, can become both more fascinating and more formidable — a perfect illustration of the poem's

central idea.

Answer: Model answer above — adapt with your own favourite part and personal reasons.

Exercise 5.15 — Let us learn — Vocabulary + Collective nouns + Eye idioms + -ish suffix

Q1 Fill in the blanks with words from the box (woven, myriad, deft, stumble, surpass, marvellous): With his 1._____ description, the author has written the story beautifully 2._____ with fascinating details. When you read the story, you will surely enjoy the 3._____ storytelling technique. What makes the story interesting is the superb way of describing the 4._____ emotions and feelings. The reader will 5._____ upon the unexpected twists that 6._____ all our understanding.

SOLUTION

1. deft — With his deft description
2. woven — the story beautifully woven with fascinating details
3. marvellous — the marvellous storytelling technique
4. myriad — the myriad emotions and feelings
5. stumble — The reader will stumble upon
6. surpass — twists that surpass all our understanding

Answer: 1-deft, 2-woven, 3-marvellous, 4-myriad, 5-stumble, 6-surpass.

Q2 Match collective nouns: 1. a swarm of ___, 2. a constellation of ___, 3. a grove of ___, 4. a troupe of ___, 5. a battalion of ___, 6. a fleet of ___. (Column 2: ships, soldiers, dancers, locusts, trees, stars)

SOLUTION

1. a swarm of locusts
2. a constellation of stars
3. a grove of trees
4. a troupe of dancers
5. a battalion of soldiers
6. a fleet of ships

Answer: 1-locusts, 2-stars, 3-trees, 4-dancers, 5-soldiers, 6-ships.

Q3 Match eye idioms with meanings: 1. apple of one's eye, 2. in the blink of an eye, 3. keep an eye on something/somebody, 4. turn a blind eye, 5. see eye to eye, 6. bird's-eye view. (Meanings: watch closely, act as if not noticing, something that happens very quickly, an overall look, a very precious person, agree with each other)

SOLUTION

1. apple of one's eye — (v) a person who is very precious or important
2. in the blink of an eye — (iii) something that happens very quickly
3. keep an eye on something or somebody — (i) watch something or someone closely
4. turn a blind eye — (ii) act as if you do not see or notice
5. see eye to eye — (vi) agree with each other
6. bird's-eye view — (iv) an overall look at something

Answer: 1-(v), 2-(iii), 3-(i), 4-(ii), 5-(vi), 6-(iv).

Q4 The poem uses 'tigerish' (tiger + -ish). Choose the nouns from (girl, glass, book, silk, boy, water, moon, scrap) to which -ish can be added to make adjectives.

SOLUTION

The suffix '-ish' can be added to these nouns from the list to make adjectives:
— girl → girlish (resembling or typical of a girl)
— boy → boyish (resembling or typical of a boy)
— moon → moonish (somewhat moon-like; pale or round — less common but valid)

The suffix '-ish' cannot be meaningfully added to: glass (glassish — not a standard word), book (bookish is possible and common — resembling a person who loves books), silk (silkish — not standard; silky is used instead), water (watery is used instead), scrap (scrappish — not standard).

Most clearly: girl → girlish, boy → boyish.
Note: bookish is also a valid and widely-used '-ish' adjective (book + ish = one who is studious or literary).

Answer: girl → girlish, boy → boyish, and by extension book → bookish are the main valid formations. Glass, silk, water, scrap, and moon do not yield standard -ish adjectives.

Exercise 5.16 — Let us speak — Magnifying Glass

Q1 Practise /v/ and /f/ sounds. Note the difference: /v/ has vibration, /f/ has no vibration. Read words with beginning/middle/end /f/ (forest, flowers, from, deft, afternoon, of, itself) and /v/ (vase, valour, victory, woven, even, hive, marvellous) sounds.

SOLUTION

/f/ — voiceless (lower lip touches upper teeth, air flows, NO vibration):
Beginning: forest, flowers, from
Middle: deft, afternoon
End: of, itself

/v/ — voiced (lower lip touches upper teeth, air flows, WITH vibration):
Beginning: vase, valour, victory
Middle: woven, even, marvellous
End: hive

Tip: Place a finger on your throat. When you say /v/, you feel the vibration; when you say /f/, you do not. Practice pairs: fan/van, fine/vine, fear/veer — the only difference is voicing.

Answer: Model answer above — practise the /f/ (no vibration) and /v/ (with vibration) minimal pairs with a hand on the throat to feel the difference.

Q2 If you could travel to space, which planet would you like to visit? Why? What five things would you take along?

SOLUTION

Model answer:
I would like to visit Mars because it is the most Earth-like planet — it has seasons, polar ice caps, and a day that lasts nearly 24 hours. Scientists have found evidence of ancient rivers, which makes me curious about whether life once existed there.

Five things I would take:
1. A high-powered camera to photograph the Martian landscape and sunsets — Martian sunsets are reportedly blue.
2. A scientific sampling kit to collect soil and rock samples for analysis.
3. A journal to record my observations — some experiences are better written

than photographed.

4. A compact music player — music would be comforting in such an isolated environment.

5. Seeds of a fast-growing plant — to test whether life can sustain itself on Mars, and as a small symbol of hope.

Answer: Model answer above — adapt with your chosen planet, reasons, and five personal items.

Q3 If you could invent something, what would you invent and how? Give reasons for your choice and speak about your wonder invention.

SOLUTION

Model answer:

I would invent an 'Air Purifier Bracelet' — a small, wearable device that continuously monitors the air quality around the wearer and filters out pollutants, allergens, and harmful gases in real time.

This invention is inspired by the story 'Feathered Friend', where the failure of an air purifier almost caused the death of an entire space crew. On Earth too, millions of people suffer from air pollution, respiratory diseases, and exposure to indoor toxins.

The bracelet would work by using a miniature sensor array to detect particles and gas concentrations, combined with a micro-filtration membrane that processes the air drawn toward the wearer's breathing zone. It would alert the wearer if pollution levels become dangerous, just like Claribel alerted the crew.

I would want this invention to be affordable and accessible to everyone, especially children in highly polluted cities.

Answer: Model answer above — adapt with your own invention idea, mechanism, and reasons.

Exercise 5.17 — Let us write — Conversation — Magnifying Glass

Q1 Create a conversation between Deepa and Asma, members of the Science Club, deciding on a model for an upcoming Science Fair. Begin: Deepa: 'Hi Asma! Our Science teacher mentioned that you have a wonderful idea for the Science Fair project.' Asma: '(hesitatingly) Yes, I do. But I'm not sure if it is good enough.' Deepa: '(encouragingly) Don't worry…'

SOLUTION

Deepa: Hi Asma! Our Science teacher mentioned that you have a wonderful idea for the Science Fair project.
Asma: (hesitatingly) Yes, I do. But I'm not sure if it is good enough.
Deepa: (encouragingly) Don't worry! I'm sure it's brilliant. What did you have in mind?
Asma: (slowly warming up) Well… I was thinking of making a working model of a water purification system. You know, using sand, gravel, activated charcoal, and a UV light at the end.
Deepa: (excitedly) That's amazing! It's practical, it's science, and it solves a real problem. I think the judges will love it!
Asma: (smiling) Really? I was worried it might seem too simple.
Deepa: Simple is effective! Remember what Mr Verma always says — the best science is the science that helps people. Who would we need to make it work?
Asma: (thinking) We'd need three or four people — one for the design, one for collecting materials, one for the write-up, and one to rehearse the explanation for the judges.
Deepa: Perfect. I'll handle the design and materials. You explain the science — you're the best at that. Should we rope in Priya for the write-up?
Asma: (nodding enthusiastically) Yes! And let's ask Rahul to help with the presentation board. Uff, I'm actually excited now!
Deepa: (laughing) See? I told you. Let's meet tomorrow after school to start planning. Deal?
Asma: Deal!

Answer: Model answer above — adapt as needed. Ensure the dialogue is engaging, advances a decision, and uses the points-to-remember format (tone cues, filler words, key information).

Exercise 5.18 — Let us explore — Visual aids + Telescopes + Ancient Indian Astronome

Q1 Visual aids for low vision: magnifying spectacles, stand magnifiers, hand-held magnifiers, and telescopes each serve different purposes. Summarise how each type helps people with low vision.

SOLUTION

The text describes four types of visual aids for people with low vision:

1. Magnifying spectacles — worn like glasses; used for close-up tasks such as reading, threading a needle, or fine handiwork that requires sustained magnification with both hands free.
2. Stand magnifiers — rest above the object on a flat surface; hands-free; keep the magnifying lens at a fixed, proper distance from the material; useful for extended reading sessions.
3. Hand-held magnifiers — smaller and lighter; can be moved over printed material easily; available with or without built-in lights; good for occasional use or checking labels and price tags.
4. Telescopes — used to see objects or signs far away rather than up close; some models can be attached directly to eyeglasses for convenience.

Together, these aids cover the full range of near-to-far vision needs, allowing people with low vision to perform daily tasks, study, and navigate public spaces more independently.

Answer: Magnifying spectacles (close-up, hands-free), stand magnifiers (flat surface, hands-free reading), hand-held magnifiers (portable, flexible), and telescopes (distant objects, some eyeglass-mounted) — each addresses different distance and usage needs.

Q2 Telescopes also use lenses. Summarise the four notable telescopes/observatories described: (1) Nainital telescope, (2) Indian Astronomical Observatory (IAO), (3) James Webb Space Telescope, (4) Mauna Kea Observatory.

SOLUTION

1. Nainital Telescope (ARIES): The largest telescope in India for studying celestial objects, located in the district of Nainital, Uttarakhand. Commissioned in 2016, it is maintained and operated by ARIES (Āryabhaṭa Research Institute of Observational Sciences).
2. Indian Astronomical Observatory (IAO), Hanle, Ladakh: A high-altitude

astronomy station at an elevation of 4,500 metres (14,764 ft). It supports optical, infrared, and gamma-ray telescopes.

3. James Webb Space Telescope (NASA): The largest, most powerful, and most complex telescope ever launched into space. Launched by NASA on 25 December 2021, it orbits the Sun at a distance of 1.5 million kilometres from Earth.

4. Mauna Kea Observatory, Hawaii, USA: One of the most important observatories in the world due to outstanding observational conditions — high elevation (4,205 m), dry environment, and stable airflow. Houses the Keck Observatory and Subaru Telescope. The Onizuka Center provides public access and guided tours.

Answer: 1-Nainital/ARIES (India's largest, 2016), 2-IAO Hanle (4500m altitude, multi-wavelength), 3-James Webb Space Telescope (NASA, launched Dec 2021), 4-Mauna Kea (Hawaii, world-class site, Keck+Subaru).

Q3 Read about ancient Indian astronomers: Āryabhaṭa, Varāhamihira, and Bhāskarachārya II. What were their key contributions?

SOLUTION

1. Āryabhaṭa: One of the most eminent astronomers of ancient India. His work Āryabhaṭiyam laid the groundwork for astronomers in subsequent centuries and remains important today. He proposed a heliocentric model of the solar system — the idea that planets orbit the Sun — centuries before Copernicus. He also provided a scientific explanation of lunar and solar eclipses.

2. Varāhamihira (sixth century CE): Astronomer, philosopher, and mathematician. He wrote the astronomical treatise Pañchasiddhāntika (Five Treatises), which was a compendium of Greek, Egyptian, Roman, and Indian astronomy — demonstrating the synthesis of global astronomical knowledge.

3. Bhāskarachārya II (tenth century CE): Mathematician-astronomer who contributed significantly to the advancement of astronomical concepts. His works Siddhāntaśiromaṇi and Karaṇakutūhala include compiled data on planetary positions, conjunctions, and eclipses.

Answer: Āryabhaṭa — heliocentric model + eclipse explanation; Varāhamihira — Pañchasiddhāntika synthesising global astronomy; Bhāskarachārya II — planetary positions, conjunctions, and eclipses in Siddhāntaśiromaṇi.

Exercise 5.19 — Let us do these activities before we read — Bibha Chowdhuri

Q1 What qualities do you associate with a scientist? Complete the word web.

SOLUTION

Model qualities for the word web:
— Curiosity: always asking 'why' and 'how'
— Persistence: continuing despite failure or setbacks
— Observation: watching carefully and noting details
— Analytical thinking: breaking problems into parts
— Open-mindedness: willing to revise beliefs based on evidence
— Honesty: reporting findings accurately, even unwelcome ones
— Creativity: designing novel experiments and solutions
— Patience: willing to repeat experiments many times

Answer: Model word web: curiosity, persistence, observation, analytical thinking, open-mindedness, honesty, creativity, patience.

Exercise 5.20 — Let us discuss — Bibha Chowdhuri

Q1 Arrange the following events from Bibha Chowdhuri's life in correct order: (1) IAU renames a star 'Bibha'; (2) first woman faculty at TIFR; (3) born in pre-independent India; (4) Government declares chair professorship in her name; (5) joined University of Manchester under Blackett; (6) nominated for Nobel Prize by Schrödinger.

SOLUTION

Correct chronological order:

1. Bibha Chowdhuri was born in pre-independent India (born 1913). [Event 3]
2. She joined the University of Manchester under the guidance of the celebrated Nobel Laureate, Patrick M.S. Blackett (1945). [Event 5]
3. She became the first woman faculty member at the Tata Institute of Fundamental Research (TIFR), (1949, upon return to India). [Event 2]
4. She was nominated for a Nobel Prize by Erwin Schrödinger (1950). [Event 6]
5. The International Astronomical Union (IAU) honoured her legacy by renaming a star in the constellation Leo as 'Bibha' (2019). [Event 1]
6. The Government of India declared a chair professorship in her name (2020). [Event 4]

Sequence: 3 → 5 → 2 → 6 → 1 → 4

Answer: Chronological order: 3 (born 1913) → 5 (Manchester 1945) → 2 (TIFR, 1949) → 6 (Nobel nomination, 1950) → 1 (star renamed, 2019) → 4 (chair professorship, 2020).

Exercise 5.21 — Let us think and reflect (Extract I) — Bibha Chowdhuri

Q1 Extract: 'In 1945, Bibha's academic journey took her to the University of Manchester. Under the guidance of the celebrated Nobel Laureate, Patrick M.S. Blackett, she delved deeper into the field of cosmic rays. Her Ph.D. thesis on cosmic rays earned local recognition, with newspapers introducing her as "India's New Woman Scientist—She has an eye for Cosmic Rays".' (i) Why is the mention of Patrick M.S. Blackett significant? (ii) What can be inferred about public perception of women scientists in the 1940s from the title? (iii) In 'celebrated Nobel Laureate', what does 'celebrated' NOT mean? (iv) Complete: 'She has an eye for Cosmic Rays' suggests that _____.

SOLUTION

(i) The mention of Patrick M.S. Blackett, a Nobel Laureate, is significant because it establishes the calibre of the academic environment in which Bibha worked. Being selected to work under a Nobel Prize-winning scientist at the University of Manchester was an exceptional honour, particularly for a woman from India in 1945. It validates the seriousness and quality of Bibha's research and demonstrates that her abilities were recognised at the highest international levels.

(ii) Correct answer: B. The world was still doubtful about the capabilities of women scientists. The title 'India's New Woman Scientist' implies that the very existence of an Indian woman scientist was newsworthy and unusual. The word 'New' and the emphasis on her gender suggest that women scientists were not yet widely accepted or celebrated — the novelty of a woman doing serious science at an international level was what made her front-page news, not just the science itself.

(iii) Correct answer: B. 'Celebrated' does NOT mean 'frequently seen in public'. In this context, 'celebrated' means famous, highly respected, and renowned for achievements — it refers to Blackett's standing in the scientific world, not his public appearances.

(iv) 'She has an eye for Cosmic Rays' suggests that Bibha Chowdhuri had a special talent, keen insight, and natural ability for the study of cosmic rays. The phrase implies she had an exceptional ability to observe, analyse, and understand cosmic ray phenomena — a skill that set her apart from her peers and earned her recognition even in a world that was sceptical of women in science.

Answer: (i) Blackett's Nobel status validates the international calibre of Bibha's work. (ii) B — world still doubtful of women scientists. (iii) B — 'frequently seen in public'. (iv) Bibha had a special natural talent and keen insight for cosmic ray research.

Exercise 5.22 — Let us think and reflect (Extract II) — Bibha Chowdhuri

Q1 Extract: 'The journey from Bibha Chowdhuri's era to today's women scientists has been long and arduous, but it is also inspiring. The struggles Chowdhuri faced are a stark reminder of how far we've come—and how much further we have to go... Bibha Chowdhuri's legacy lives on. Her story continues to inspire young women to pursue their passions, break barriers, and leave their mark on the world. As the stars of Indian science shine brighter, Bibha Chowdhuri, the beacon–"beam of light," will always guide the way.' (i) What can be inferred about challenges faced by women scientists today? (ii) What does 'Bibha Chowdhuri's legacy lives on' suggest? (iii) Why is Bibha Chowdhuri referred to as a 'beacon' and 'beam of light'? (iv) Is the last sentence a fact or an opinion?

SOLUTION

(i) Correct answer: B. The challenges remain, but progress has been made. The text acknowledges the journey has been 'long and arduous', implying difficulties have not disappeared entirely, but also says it is 'inspiring' and speaks of how far we've come. This suggests that while barriers still exist for women in science, significant progress has been made since Bibha's era.

(ii) The phrase 'Bibha Chowdhuri's legacy lives on' suggests that Bibha's contributions and spirit continue to influence the present, even though she has passed away. Her story serves as an enduring source of inspiration for young women who aspire to careers in science, her name has been honoured (star renamed 'Bibha', chair professorship), and the women scientists of ISRO and other institutions are building on the foundation she helped lay.

(iii) Bibha Chowdhuri is referred to as a 'beacon' because she was a guiding light for future generations — her life and work showed women that a path in science was possible, even in the face of enormous obstacles. She is called a 'beam of light' both literally (the star renamed 'Bibha' means 'beam of light' in Sanskrit) and symbolically — she brought light into the darkness of exclusion and inequality, illuminating a way forward for women in STEM. Both metaphors emphasise her role as an inspiring example rather than a famous celebrity.

(iv) The sentence 'Bibha Chowdhuri was the beacon, the "beam of light" whose story continues to inspire young women' is an opinion. It expresses a subjective judgement about Bibha's impact on young women — it cannot be empirically verified. While there is evidence of her renaming as a star and a chair professorship, the claim that her story 'inspires' young women is an evaluative

statement, not a verifiable fact.

Answer: (i) B — challenges remain, but progress has been made. (ii) Her influence and inspiration continue beyond her death. (iii) Literally: star 'Bibha' means 'beam of light'; symbolically: she lit the path through exclusion for women in science. (iv) Opinion — the claim about ongoing inspiration is evaluative, not verifiable.

Exercise 5.23 — Let us think and reflect (Long answers) — Bibha Chowdhuri

Q1 Why is Bibha Chowdhuri considered a pioneer in the field of science?

SOLUTION

Bibha Chowdhuri is considered a pioneer for multiple reasons.

First, she was India's first woman physicist, breaking into a field that was entirely male-dominated at a time when women in India had very limited access to higher education, let alone advanced scientific research.

Second, she was the first Indian woman to excel in high-energy particle physics — a highly specialised and technically demanding field. She earned a Ph.D. from the University of Manchester under Nobel Laureate Patrick M.S. Blackett, which placed her among the finest researchers of her generation.

Third, her most notable scientific contribution was the discovery of pi-mesons — a subatomic particle — which was significant enough to earn her a Nobel Prize nomination in 1950 from Erwin Schrödinger, one of the greatest scientists of the twentieth century.

Fourth, she became the first woman faculty member at the Tata Institute of Fundamental Research (TIFR), personally selected by Homi J. Bhabha — one of the architects of India's nuclear programme.

Despite never receiving awards during her lifetime, she worked tirelessly for decades across leading institutions. She is a pioneer not only for what she discovered, but for the barriers she broke simply by being present in spaces where no woman had stood before.

Answer: Bibha is a pioneer as India's first woman physicist, first Indian woman in high-energy particle physics, discoverer of pi-mesons, Nobel Prize nominee, and first woman faculty at TIFR — all achieved against formidable social barriers.

Q2 What does Bibha Chowdhuri's nomination by Erwin Schrödinger tell us about her abilities?

SOLUTION

Bibha Chowdhuri's nomination for a Nobel Prize in 1950 by Erwin Schrödinger — himself a Nobel Laureate and one of the founding figures of quantum mechanics — is a powerful testament to her exceptional abilities.

For Schrödinger to nominate her, he must have judged her work to be of Nobel-calibre significance. The discovery of pi-mesons, which was her most notable contribution, was a frontier achievement in particle physics at a time when subatomic particle research was transforming science. The fact that a figure of Schrödinger's stature recognised her work suggests she was working at the highest levels of international science.

The nomination also tells us that her talent transcended the barriers of gender and geography. In an era when women were largely excluded from serious scientific discourse, Bibha's work was so outstanding that it could not be ignored even by the most celebrated scientists of her time.

Though the nomination was ultimately unsuccessful, it stands as undeniable evidence of the quality and importance of Bibha Chowdhuri's scientific contributions.

Answer: Schrödinger's nomination (a Nobel laureate endorsing another) proves Bibha's work was internationally recognised as frontier science — her discovery of pi-mesons was judged Nobel-worthy by one of the greatest scientists of the twentieth century.

Q3 Bibha Chowdhuri never worked for awards or recognition. Support this statement with evidence from the text.

SOLUTION

The text provides clear evidence to support this statement.

First, Bibha 'never received any awards during her lifetime, but continued her work tirelessly.' This shows that the absence of recognition did not diminish her commitment to science. She kept working — at the Tata Institute of Fundamental Research, the Physical Research Laboratory in Ahmedabad, and the Saha Institute of Nuclear Physics — not for prizes but for the work itself.

Second, 'she remained in the periphery of Indian scientific acclaim' throughout her career. Despite making significant contributions, she did not seek public recognition or celebrity. Her work 'went on quietly', as the text describes, in contrast to the male counterparts whose names the world celebrated while hers was 'whispered only in the halls of those who recognised her brilliance.'

Third, she 'passed away in 1991, her story untold, her name largely forgotten.' The fact that she died in obscurity, without making any visible attempt to publicise

her contributions, is itself evidence that her motivation was the science, not the accolades.

Together, these points show that Bibha's drive came entirely from within — from her curiosity, persistence, and love for scientific inquiry — rather than from any desire for external validation.

Answer: Evidence: she never received awards but 'continued her work tirelessly'; worked 'quietly' in the periphery; passed away in 1991 with her 'story untold' — her motivation was purely the science itself, not recognition.

Q4 How does the renaming of a star as 'Bibha' serve as both a literal and symbolic recognition of her contributions to science?

SOLUTION

Literal recognition: In 2019, the International Astronomical Union (IAU) officially renamed a real star — HD 86081, in the constellation Leo — as 'Bibha'. This is a concrete, permanent, and internationally recognised honour. The star will carry her name for as long as it exists, making her contribution literally written into the universe.

Symbolic recognition: The word 'Bibha' in Sanskrit means 'beam of light'. The text notes that Bibha Chowdhuri worked in cosmic rays — the study of radiation and particles from space. A scientist who studied celestial light and energy is now immortalised as a star that emits light. The naming is symbolically perfect: she brought light to the dark, male-dominated world of Indian science; now she is, fittingly, 'a star in heaven.'

The renaming also serves as recognition of a woman who was, in the text's words, 'whispered only in the halls of those who recognised her brilliance' during her lifetime. By giving her name to a star visible to the whole world, the IAU has elevated her from obscurity to cosmic permanence — the ultimate tribute to someone who spent her life studying the cosmos.

Answer: Literally: IAU officially renamed star HD 86081 as 'Bibha' — a permanent, international astronomical record. Symbolically: 'Bibha' means 'beam of light'; a cosmic ray scientist is immortalised as a star — she is now 'a star in heaven', forever guiding others.

Q5 How do the roles of women in ISRO today reflect broader changes in societal attitudes towards women in STEM in India?

SOLUTION

The text presents ISRO as a concrete symbol of how societal attitudes towards women in STEM have changed since Bibha Chowdhuri's era.

When Bibha was working in the 1940s and 50s, women 'struggled to seek knowledge and equitable access to education'. She was a rare exception, and even her exceptional talent meant she remained 'in the periphery of Indian scientific acclaim', unrecognised and unrewarded.

By contrast, over 50 women contributed to Chandrayaan-3, and Dr. Ritu Karidhal Srivastava — the 'Rocket Woman of India' — played a pivotal leadership role in the Mars Orbiter Mission, Chandrayaan-2, and Chandrayaan-3. These women are not on the periphery; they are 'no longer participants but leaders in missions that make global headlines.'

This shift reflects a broader societal change: women now have greater access to education, are encouraged to pursue STEM careers, and are recognised publicly for their achievements. Institutional support (universities, ISRO, government schemes) has grown, social expectations have evolved, and role models like Bibha — though belated — inspire the next generation.

However, the text also notes that 'how much further we have to go' — acknowledging that the journey towards full gender equity in science is not yet complete.

Answer: ISRO's women have moved from invisible periphery to celebrated leadership (50+ in Chandrayaan-3, Dr. Ritu Karidhal as 'Rocket Woman') — reflecting broader gains in access, opportunity, and recognition, though the journey is not yet complete.

Q6 What is the writer's purpose of highlighting the contributions of Bibha Chowdhuri and other modern women scientists?

SOLUTION

The writer's purpose is multi-layered.

First, the writer aims to correct a historical injustice: Bibha Chowdhuri's contributions were largely forgotten, and the text explicitly seeks to restore her

rightful place in India's scientific history. Bringing her story to a wider audience is an act of recognition she never received in her lifetime.

Second, the writer wants to inspire young readers — especially young women — by showing that the barriers Bibha faced, though real and steep, were not insurmountable. Her example proves that talent and persistence can succeed even in the most hostile environments.

Third, by drawing a line from Bibha to the women of ISRO today, the writer shows the cumulative nature of progress: the achievements of today's women scientists are built on the foundations laid by pioneers like Bibha. This gives her story relevance and resonance in the present.

Finally, the writer implicitly challenges the reader to ask: how many more Bibhas were lost to neglect and systemic exclusion? And what can we do to ensure that future pioneers are recognised in their own time?

Answer: The writer aims to correct historical erasure, inspire young women, show the continuity between pioneers and today's women scientists, and prompt readers to reflect on systemic barriers in STEM.

Q7 How might this text help shape people's perception of the role of women in other traditionally male-dominated fields?

SOLUTION

This text could reshape perceptions of women in male-dominated fields in several important ways.

First, Bibha's story demonstrates that the absence of women in a field historically does not reflect a lack of ability, but a lack of access and opportunity. Once given the chance, Bibha excelled at the highest levels — earning a Ph.D. under a Nobel Laureate and a Nobel nomination herself. This challenges any notion of inherent unsuitability.

Second, the text shows that exclusion has costs — not just for the individuals excluded, but for society as a whole. By marginalising Bibha, India potentially missed decades of scientific contributions from her and others like her. This argument applies equally to law, medicine, engineering, the military, and other fields.

Third, the contrast between Bibha's era and the women of ISRO today shows that

change is possible — that systemic barriers can be dismantled through determination, policy, and changing expectations.

By showing a concrete, inspiring example of a woman who succeeded in the hardest possible conditions, the text invites readers to question old assumptions about who belongs in any field — and to actively support inclusion wherever they find themselves.

Answer: The text shows that women's absence from male-dominated fields reflects denied access, not lack of ability; that exclusion costs society; and that change is possible — lessons applicable to any field beyond science.

Exercise 5.24 — Let us learn — Antonyms crossword + Vocabulary substitution + Suffixe

Q1 Complete the crossword with antonyms from the text. Across: 4. core, 5. dependent, 7. extinguish, 8. terrestrial. Down: 1. effortless, 2. weakness, 3. neglect, 6. trivial.

SOLUTION

Across (antonyms of the clue words):

4. core → periphery
5. dependent → autonomous
7. extinguish → ignite
8. terrestrial → cosmic (or celestial)

Down (antonyms of the clue words):

1. effortless → arduous
2. weakness → tenacity (or persistence/strength)
3. neglect → persistence (or delve/recognition)
6. trivial → notable (or significant)

Answer: Across: 4-periphery, 5-autonomous, 7-ignite, 8-cosmic/celestial. Down: 1-arduous, 2-tenacity/strength, 3-persistence/recognition, 6-notable.

Q2 Substitute the underlined phrases with words from the box (physicist, peers, luminaries, barriers, pioneers, persistence): 1. the first people to start online markets; 2. a scientist who studies matter, energy, light; 3. friends who are classmates and same age; 4. famous and important people welcomed at award ceremony; 5. his continuous efforts and determination; 6. remove all things that block our way.

SOLUTION

1. pioneers — They are considered to be the pioneers of online markets.
2. physicist — A physicist who studies matter, energy, light, etc.
3. peers — Most of my friends are my peers.
4. luminaries — We first welcomed all the luminaries in folk song for the award ceremony.
5. persistence — My brother finally succeeded in his business because of his persistence.
6. barriers — We should remove all the barriers in achieving success.

Answer: 1-pioneers, 2-physicist, 3-peers, 4-luminaries, 5-persistence, 6-barriers.

Q3 Add suffixes -ship, -ment, or -hood to: 1. member, 2. govern, 3. partner, 4. child, 5. citizen, 6. entertain, 7. brother, 8. agree.

SOLUTION

1. member + ship = membership
2. govern + ment = government
3. partner + ship = partnership
4. child + hood = childhood
5. citizen + ship = citizenship
6. entertain + ment = entertainment
7. brother + hood = brotherhood
8. agree + ment = agreement

Answer: 1-membership, 2-government, 3-partnership, 4-childhood, 5-citizenship, 6-entertainment, 7-brotherhood, 8-agreement.

Q4 Circle the acronyms in the grid for: 1. NASA, 2. AIIMS, 3. AYUSH, 4. NIPER, 5. WHO.

SOLUTION

The acronyms to find and circle in the word-search grid are:

1. NASA — National Aeronautics and Space Administration
2. AIIMS — All India Institute of Medical Sciences
3. AYUSH — Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homoeopathy
4. NIPER — National Institute of Pharmaceutical Education and Research
5. WHO — World Health Organization

These are the correct full forms to match to their acronyms in the grid.

Answer: NASA (1), AIIMS (2), AYUSH (3), NIPER (4), WHO (5) — locate and circle each in the word-search grid.

Q5 Clipping: Identify the clipping type (back/front/middle) for: lab (laboratory), exam (examination), ad (advertisement), phone (telephone), net (internet), bike (motorbike), flu (influenza), fridge (refrigerator).

SOLUTION

Back clipping (front part retained, end removed):
— lab (labo-ratory)
— exam (examin-ation)
— ad (advert-isement)
— gas (gaso-line)
— memo (memor-andum)
— gym (gymnas-ium)
— photo (photo-graph)

Front clipping (end part retained, front removed):
— phone (tele-phone)
— net (inter-net)
— bike (motor-bike)

Middle clipping (front and end removed, middle retained):
— flu (in-flu-enza)
— fridge (re-fridge-rator)

Answer: Back: lab, exam, ad, gas, memo, gym, photo. Front: phone, net, bike. Middle: flu, fridge.

Q6 Complete the news report using passive form of verbs (discover, test, measure, publish, record, take): Last year, significant advancements 1._____ in leading medical journals when a new vaccine 2._____. The vaccine 3._____ through several clinical trials and results 4._____ in those journals. Blood samples 5._____ regularly from participants. The amount of antibodies produced 6._____ carefully.

SOLUTION

1. were published — significant advancements were published in leading medical journals
2. was discovered — a new vaccine for malaria was discovered
3. was tested — the vaccine was tested through several clinical trials
4. were recorded — results were recorded in those journals

5. were taken — blood samples were taken regularly from participants
6. was measured — the amount of antibodies produced was measured carefully

Answer: 1-were published, 2-was discovered, 3-was tested, 4-were recorded, 5-were taken, 6-was measured.

Q7 Rewrite the experiment report using passive voice: 'I conducted an experiment to investigate the effects of light on plant growth. I placed various plants under different light conditions and measured their growth over several weeks. I recorded data daily. At the end, I analysed the results and found that plants exposed to natural light grew significantly taller. I concluded that sunlight plays a crucial role in plant development. I presented my findings to the class…'

SOLUTION

An experiment was conducted to investigate the effects of light on plant growth. Various plants were placed under different light conditions and their growth was measured over several weeks. Data was recorded daily to track the height of each plant. At the end of the experiment, the results were analysed and it was found that plants exposed to natural light grew significantly taller than those under artificial light. It was concluded that sunlight plays a crucial role in plant development. The findings were presented to the class, highlighting the importance of light in enhancing photosynthesis and overall plant health.

Answer: Model passive-voice rewrite above.

Q8 Complete the Chandrayaan landing passage choosing correct passive voice form: 1. spacecraft _____ towards Moon (was launched/is launched/were launched/launched); 2. it _____ to enter Moon's orbit (was positioned/is positioned/has positioned/position); 3. spacecraft's path _____ for landing (was adjusted/is adjusted/adjusted/were adjusted); 4. spacecraft _____ near Moon's surface (was slowed down/is slowed down/were slowed down/slowed down); 5. rover _____ to explore (is released/has released/were released/was released).

SOLUTION

The passage describes a sequence of past events (Chandrayaan's landing mission steps), so past passive is required throughout.

1. C. was launched — First, the spacecraft was launched towards the Moon from the Earth.

2. B. was positioned — Then, it was positioned to enter the Moon's orbit.
3. B. was adjusted — After reaching the Moon's orbit, the spacecraft's path was adjusted for landing.
4. B. was slowed down — Next, the spacecraft was slowed down as it neared the Moon's surface.
5. D. was released — Finally, the rover was released to explore the surface and collect valuable data.

Answer: 1-C (was launched), 2-B (was positioned), 3-B (was adjusted), 4-B (was slowed down), 5-D (was released).

Exercise 5.25 — Let us speak — Panel Discussion on Mobile Phones — Bibha Chowdhu

Q1 Panel discussion: 'Evaluating the Impact of Mobile Phones — Beneficial or Harmful'. Roles: Moderator, Principal (opposed — discipline), Teacher (partially in favour — educational use with limits), Parent (opposed — health/social), Student (in favour — connectivity and learning). Prepare talking points for each role.

SOLUTION

MODERATOR: Good afternoon. Today we debate the motion: 'Mobile phones are more harmful than beneficial for students.' I invite our Principal to begin.

PRINCIPAL: As a Principal, I strongly believe mobile phones are largely disruptive because they are a constant source of distraction during class hours. Students spend more time on social media than on studies. Discipline suffers when phones ring during lessons or when students secretly use them under desks. The school environment requires focused attention, and phones undermine that.

TEACHER: From an educator's perspective, I think mobile phones can be valuable but must be used with strict limitations. Apps like DIKSHA and Khan Academy bring learning resources to students who cannot afford private tuitions. However, unregulated use is counterproductive. I support a policy of phones-off during class, phones-permitted during free periods for educational use only.

PARENT: As a parent, I'm concerned that mobile phones pose certain risks to children's health and social development. Excessive screen time affects sleep, vision, and posture. More worryingly, children are exposed to harmful content and cyberbullying. Social skills suffer when children prefer texting to face-to-face conversation. I would prefer a monitored, time-limited approach.

STUDENT: As a student, I feel mobile phones are essential because they connect us instantly — for academic help, for emergencies, and for staying in touch with family. They help us research projects, access dictionaries, and collaborate with classmates. The problem isn't the phone; it's how it's used. With digital literacy education, students can use phones responsibly.

MODERATOR: Thank you all. To summarise: there is agreement that context matters — educational use can be valuable, but unregulated use is harmful. A balanced, policy-driven approach seems to be the consensus.

Answer: Model answer above — adapt each role's talking points and conduct the discussion in class using the prompt phrases provided.

Exercise 5.26 — Let us write — Report on Zonal Science Exhibition — Bibha Chowdhuri

Q1 Write a report on the Zonal Science Exhibition for the school magazine. Cues: organiser, date/time/venue, purpose, participants (25 schools), Chief Guest, competitions (Science Quiz, Science Models), topics of models, best exhibit trophy, Chief Guest's observations. Format: headline, reporter's name, three paragraphs. Use past tense, passive voice, third person.

SOLUTION

ZONAL SCIENCE EXHIBITION SHOWCASES YOUNG INNOVATORS
Reported by [Student Name], Student Editor

The Zonal Science Exhibition was hosted by Sunrise Public School on 10 March 2025 in the school's main auditorium and open grounds. The exhibition was organised by the District Education Office as part of the annual effort to promote scientific thinking among school students. Teams from 25 schools across the zone were invited to participate and were welcomed with great enthusiasm.

The event was inaugurated by the Chief Guest, Dr. Meena Sharma, a prominent scientist from the National Institute of Science Education and Research (NISER). Two major competitions were held: the Science Quiz, in which teams of three students each were tested on general science, technology, and environmental topics; and the Science Models exhibition, where over 60 models were displayed. Notable models included a solar-powered water purifier, a working seismograph, and an AI-based plant monitoring system. The best exhibit trophy was awarded to the team from Modern School for their working model of a low-cost water filtration unit, which was praised for its practical application and clarity of presentation.

The Chief Guest expressed her admiration for the creativity and scientific rigour displayed by the young participants. She urged students to always stay curious and to connect classroom learning with real-world problems. The exhibition was concluded with a vote of thanks by the school's Science Club President, and it was noted that the event had inspired students to pursue careers in science and technology.

Answer: Model answer above — adapt with your own school's details, date, and models. Ensure past tense, passive voice, third person, and the three-paragraph format.

Exercise 5.27 — Let us explore — AR/VR in Education + Rashtriya Vigyan Puraskar — E

Q1 Augmented Reality (AR) and Virtual Reality (VR) are changing how students learn. NCERT has developed the e-Pathshala AR App. How do AR and VR enhance learning, and what is the significance of the e-Pathshala AR App?

SOLUTION

AR enhances a person's environment by adding digital elements to what they see in real time, typically through a smartphone camera. VR offers a fully immersive experience, replacing the real world with a simulated environment. Together, they allow students to see and interact with things that would be impossible in a regular classroom — such as exploring the human body from the inside, witnessing a volcanic eruption up close, or conducting virtual chemistry experiments without safety risks.

For younger students, AR and VR make abstract or difficult concepts tangible and engaging. A student who struggles to understand the structure of DNA from a textbook diagram can rotate and explore a 3D AR model of it. This shift from passive reading to active experience transforms students from listeners to explorers.

The e-Pathshala AR App, developed by NCERT under MHRD, represents a significant step in India's educational technology. It aims to take learning beyond textbooks and classroom walls, enabling students to experiment directly with concepts. This is aligned with the Prime Minister's Digital India vision to empower sectors using technology and to address the need for skill, scale, and speed in education.

Answer: AR adds digital overlays to the real world; VR creates fully immersive simulations — both enable students to interact with concepts too abstract, large, or dangerous for physical classrooms. e-Pathshala AR App extends this to Indian schools under Digital India.

Q2 Describe the four categories of the Rashtriya Vigyan Puraskar (RVP) awards.

SOLUTION

The Rashtriya Vigyan Puraskar (RVP) is the Government of India's new national awards in the field of Science, Technology, and Innovation. There are four categories:

1. Vigyan Ratna (VR): Recognises lifetime achievements and contributions made in any field of science and technology — the highest honour for a sustained career of excellence.
2. Vigyan Shri (VS): Recognises distinguished contributions in any field of science and technology — for significant but not necessarily lifetime-spanning achievements.
3. Vigyan Yuva-Shanti Swarup Bhatnagar (VY-SSB): Recognises and encourages young scientists up to the age of 45 years who have made an exceptional contribution in any field of science and technology — aimed at motivating the next generation.
4. Vigyan Team (VT): Awarded to a team of three or more scientists, researchers, or innovators who have made an exceptional contribution working collaboratively in any field of science and technology — recognising the team-based nature of modern research.

Answer: VR (lifetime achievement), VS (distinguished contribution), VY-SSB (young scientists under 45), VT (team of 3+ researchers) — covering career, mid-career, emerging, and collaborative scientific contributions.