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SUMMARY AND CONCLUSION

This document contains the test result of the question generation model developed. The test has been conducted for five categories of question generation, English, Chemistry, Physics, Biology, and Mathematics. 10 tests per each category have been conducted. The quality of generation has been tested by analyzing and examining questions, difficulty level, uniformity in generation, JSON format correctness, quality of MCQ questions and right answer correctness, etc.

The input text or the input sentence, number of words in the input text, and the generated questions in each category are given in the below report. Problems such as JSON error, right answer option confusion are found and solved.

Conclusion:

- The quality of the generated questions are satisfactory.
- The models also generated Yes/No questions, fill in the blank questions with two blanks, none of the above and all of the above type questions - Those questions are highlighted in yellow in the report.
- Good quality questions are also highlighted in yellow.
- In case of MCQs, both “right option number” and “right option” are added in the JSON output.
- The time taken for generation depends on the length of the input.

1. ENGLISH (9 tests)

1. 123 words

INPUT = “One hot day in the forest, a lion started feeling hungry. He was starting to hunt for his food when he found a rabbit roaming around alone. Instead of catching the rabbit, the lion let it go – “a small rabbit-like this cannot satisfy my hunger”, he said and scoffed. Then, a beautiful deer passed by, and he decided to take his chances – he ran and ran after the deer, but since he was weak due to hunger, he struggled to keep up with the deer’s speed. The tired and defeated lion went back to look for the rabbit to fill his stomach for a while, but he was gone. The lion was sad and was hungry for a long time.”

OUTPUT =

'multiple_choice_questions':

{'question_number': 1, 'question': 'What did the lion find in the forest?', 'option1': 'A rabbit', 'option2': 'A deer', 'option3': 'A wolf', 'option4': 'A bear', 'right_answer': 'A rabbit'},

{'question_number': 2, 'question': 'Why did the lion let the rabbit go?', 'option1': 'He was not hungry', 'option2': 'He thought the rabbit was too small', 'option3': 'He was afraid of the rabbit', 'option4': 'He didn't like the taste of rabbit', 'right_answer': 'He thought the rabbit was too small'},

{'question_number': 3, 'question': 'What animal did the lion run after?', 'option1': 'A rabbit', 'option2': 'A deer', 'option3': 'A wolf', 'option4': 'A bear', 'right_answer': 'A deer'},

{'question_number': 4, 'question': 'Why did the lion struggle to catch the deer?', 'option1': 'The deer was too fast', 'option2': 'The lion was weak', 'option3': 'The lion was not interested in the deer', 'option4': 'The lion was afraid of the deer', 'right_answer': 'The lion was weak'},

{'question_number': 5, 'question': 'What happened to the rabbit when the lion went back to find it?', 'option1': 'It was still there', 'option2': 'It had run away', 'option3': 'It was caught by another animal', 'option4': 'It was sleeping', 'right_answer': 'It had run away'}],

'single_word_answer_type_questions': [

{ 'question_number': 1, 'question': 'What did the lion let go?', 'right_answer': 'Rabbit'},

{ 'question_number': 2, 'question': 'What animal did the lion chase?', 'right_answer': 'Deer'},

{ 'question_number': 3, 'question': 'How did the lion feel at the end?', 'right_answer': 'Sad'},

{ 'question_number': 4, 'question': "What was the lion's initial thought about the rabbit?", 'right_answer': 'Too small'},

{ 'question_number': 5, 'question': "What happened to the lion after he couldn't catch the deer?", 'right_answer': 'Hungry'}],

'fill_in_the_blank_type_questions': [

{ 'question_number': 1, 'question': 'The lion started feeling _____ in the forest.', 'right_answer': 'Hungry'},

{ 'question_number': 2, 'question': 'The lion was weak due to _____.', 'right_answer': 'Hunger'},

{ 'question_number': 3, 'question': 'The lion went back to look for the _____ to fill his stomach.', 'right_answer': 'Rabbit'},

{ 'question_number': 4, 'question': 'The lion was _____ for a long time.', 'right_answer': 'Hungry'},

{ 'question_number': 5, 'question': "The lion struggled to keep up with the deer's _____.", 'right_answer': 'Speed'}],

'descriptive_type_questions': [

{ 'question_number': 1, 'question': "Describe the lion's hunger in the forest.",
'right_answer': 'The lion started feeling hungry and was starting to hunt for his food.' },

{ 'question_number': 2, 'question': 'What happened when the lion found a rabbit?',
'right_answer': 'The lion let it go, thinking that a small rabbit could not satisfy his hunger.' },

{ 'question_number': 3, 'question': 'Why did the lion decide to chase the deer?',
'right_answer': 'The lion thought that the deer could satisfy his hunger better than the rabbit.' },

{ 'question_number': 4, 'question': "What happened when the lion couldn't catch the deer?",
'right_answer': 'The lion went back to look for the rabbit, but it had run away.' },

{ 'question_number': 5, 'question': 'How did the lion feel after being unable to find food?',
'right_answer': 'The lion felt sad and was hungry for a long time.' } }

2. 1270 words

INPUT = THE Maharaja of Pratibandapuram is the hero of this story. He may be identified as His Highness Jamedar-General, Khiledar-Major, Sata Vyaghra Samhari, Maharajadhiraja Visva Bhuvana Samrat, Sir Jilani Jung Jung Bahadur, M.A.D., A.C.T.C., or C.R.C.K. But this name is often shortened to the Tiger King. I have come forward to tell you why he came to be known as Tiger King. I have no intention of pretending to advance only to end in a strategic withdrawal. Even the threat of a Stuka bomber will not throw me off track. The Stuka, if it likes, can beat a hasty retreat from my story. Right at the start, it is imperative to disclose a matter of vital importance about the Tiger King. Everyone who reads of him will experience the natural desire to meet a man of his indomitable courage face-to-face. But there is no chance of its fulfilment. As Bharata said to Rama about Dasaratha, the Tiger King has reached that final abode of all living creatures. In other words, the Tiger King is dead. The manner of his death is a matter of extraordinary interest. It can be revealed only at the end of the tale. The

most fantastic aspect of his demise was that as soon as he was born, astrologers had foretold that one day the Tiger King would actually have to die. “The child will grow up to become the warrior of warriors, hero of heroes, champion of champions. But...” they bit their lips and swallowed hard. When compelled to continue, the astrologers came out with it. “This is a secret which should not be revealed at all. And yet we are forced to speak out. The child born under this star will one day have to meet its death.” At that very moment a great miracle took place. An astonishing phrase emerged from the lips of the ten-day-old Jilani Jung Jung Bahadur, “O wise prophets!” Everyone stood transfixed in stupefaction. They looked wildly at each other and blinked. “O wise prophets! It was I who spoke.” This time there were no grounds for doubt. It was the infant born just ten days ago who had enunciated the words so clearly. The chief astrologer took off his spectacles and gazed intently at the baby. “All those who are born will one day have to die. We don’t need your predictions to know that. There would be some sense in it if you could tell us the manner of that death,” the royal infant uttered these words in his little squeaky voice. The chief astrologer placed his finger on his nose in wonder. A baby barely ten days old opens its lips in speech! Not only that, it also raises intelligent questions! Incredible! Rather like the bulletins issued by the war office, than facts. The chief astrologer took his finger off his nose and fixed his eyes upon the little prince. “The prince was born in the hour of the Bull. The Bull and the Tiger are enemies, therefore, death comes from the Tiger,” he explained. You may think that crown prince Jung Jung Bahadur was thrown into a quake when he heard the word ‘Tiger’. That was exactly what did not happen. As soon as he heard it pronounced, the crown prince gave a deep growl. Terrifying words emerged from his lips. “Let tigers beware!” This account is only a rumour rife in Pratibandapuram. But with hindsight we may conclude it was based on some truth. II Crown prince Jung Jung Bahadur grew taller and stronger day by day. No other miracle marked his childhood days apart from the event already described. The boy drank the milk of an English cow, was brought up by an English nanny, tutored in English by an Englishman, saw nothing but English films — exactly as the crown princes of all the other Indian states did. When he came of age at twenty, the State, which had been with the Court of Wards until then, came into his hands. But everyone in the kingdom remembered the astrologer’s prediction. Many continued to discuss the matter. Slowly it came to the Maharaja’s ears. There were innumerable forests in the Pratibandapuram State. They had tigers in them. The Maharaja knew the old saying, ‘You may kill even a cow in self-defence’. There could certainly be no objection to killing tigers in

self-defence. The Maharaja started out on a tiger hunt. The Maharaja was thrilled beyond measure when he killed his first tiger. He sent for the State astrologer and showed him the dead beast. "What do you say now?" he demanded. "Your majesty may kill ninety-nine tigers in exactly the same manner. But..." the astrologer drawled. "But what? Speak without fear." "But you must be very careful with the hundredth tiger." 11The Tiger King "What if the hundredth tiger were also killed?" "Then I will tear up all my books on astrology, set fire to them, and..." "And..." "I shall cut off my tuft, crop my hair short and become an insurance agent," the astrologer finished on an incoherent note. III From that day onwards it was celebration time for all the tigers inhabiting Pratibandapuram. The State banned tiger hunting by anyone except the Maharaja. A proclamation was issued to the effect that if anyone dared to fling so much as a stone at a tiger, all his wealth and property would be confiscated. The Maharaja vowed he would attend to all other matters only after killing the hundred tigers. Initially the king seemed well set to realise his ambition. Not that he faced no dangers. There were times when the bullet missed its mark, the tiger leapt upon him and he fought the beast with his bare hands. Each time it was the Maharaja who won. At another time he was in danger of losing his throne. A high-ranking British officer visited Pratibandapuram. He was very fond of hunting tigers. And fonder of being photographed with the tigers he had shot. As usual, he wished to hunt tigers in Pratibandapuram. But the Maharaja was firm in his resolve. He refused permission. "I can organise any other hunt. You may go on a boar hunt. You may conduct a mouse hunt. We are ready for a mosquito hunt. But tiger hunt! That's impossible!" The British officer's secretary sent word to the Maharaja through the dewan that the durai himself did not have to kill the tiger. The Maharaja could do the actual killing. What was important to the durai was a photograph of himself holding the gun and standing over the tiger's carcass. But the Maharaja would not agree even to this proposal. If he relented now, what would he do if other British officers turned up for tiger hunts? Because he prevented a British officer from fulfilling his desire, the Maharaja stood in danger of losing his kingdom itself. The Maharaja and the dewan held deliberations over this issue. As a result, a telegram was despatched forthwith to a famous British company of jewellers in Calcutta. 'Send samples of expensive diamond rings of different designs.' Some fifty rings arrived. The Maharaja sent the whole lot to the British officer's good lady. The king and the minister expected the duraisani to choose one or two rings and send the rest back. Within no time at all the duraisani sent her reply: 'Thank you very much for your gifts.' In two days a bill for three lakh of rupees came

from the British jewellers. The Maharaja was happy that though he had lost three lakh of rupees, he had managed to retain his kingdom. ""

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What was the name often shortened to the Maharaja of Pratibandapuram?', 'option1': 'Sir Jilani Jung Jung Bahadur', 'option2': 'Sata Vyaghra Samhari', 'option3': 'Maharajadhiraja Visva Bhuvana Samrat', 'option4': 'Tiger King', 'right_answer': 'Tiger King'},

{'question_number': 2, 'question': "What did the astrologers foretell about the Tiger King's death?", 'option1': 'He will die in a war', 'option2': 'He will die by a Stuka bomber', 'option3': 'He will die by a Tiger', 'option4': 'He will die of old age', 'right_answer': 'He will die by a Tiger'},

{'question_number': 3, 'question': "Why did the crown prince Jung Jung Bahadur growl when he heard the word 'Tiger'?", 'option1': 'He was scared of tigers', 'option2': 'He was angry at tigers', 'option3': 'He wanted to hunt tigers', 'option4': 'He was mimicking a tiger', 'right_answer': 'He was mimicking a tiger'},

{'question_number': 4, 'question': 'What did the astrologer threaten to do if the hundredth tiger was killed?', 'option1': 'Burn his books on astrology', 'option2': 'Become an insurance agent', 'option3': 'Cut off his tuft and crop his hair', 'option4': 'All of the above', 'right_answer': 'All of the above'},

{'question_number': 5, 'question': 'Why did the Maharaja ban tiger hunting by anyone except himself?', 'option1': 'To protect the tigers', 'option2': 'To prevent others from getting the credit', 'option3': 'To assert his power', 'option4': "To fulfill an astrologer's prediction", 'right_answer': "To fulfill an astrologer's prediction"}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What was the name often shortened to the Maharaja of Pratibandapuram?', 'right_answer': 'Tiger King'},

{'question_number': 2, 'question': "What did the astrologers foretell about the Tiger King's death?", 'right_answer': 'He will die by a Tiger'},

{'question_number': 3, 'question': "Why did the crown prince Jung Jung Bahadur growl when he heard the word 'Tiger'?", 'right_answer': 'He was mimicking a tiger'},

{'question_number': 4, 'question': 'What did the astrologer say about the hundredth tiger?', 'right_answer': 'It will be the most dangerous tiger'},

{'question_number': 5, 'question': 'Why did the Maharaja ban tiger hunting by anyone except himself?', 'right_answer': "To fulfill an astrologer's prediction"}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The Maharaja of Pratibandapuram is also known as the _____.', 'right_answer': 'Tiger King'},

{'question_number': 2, 'question': 'The astrologers foretold that the Tiger King will die by a _____.', 'right_answer': 'Tiger'},

{'question_number': 3, 'question': "The crown prince Jung Jung Bahadur growl when he heard the word 'Tiger' as he was _____ a tiger.", 'right_answer': 'mimicking'},

{'question_number': 4, 'question': 'The astrologer said that the hundredth tiger will be the most _____ tiger.', 'right_answer': 'dangerous'},

{'question_number': 5, 'question': 'The Maharaja banned tiger hunting by anyone except himself to fulfill the _____ prediction.', 'right_answer': "astrologer's"}],

'descriptive_type_questions': [

{'question_number': 1, 'question': "Describe the prediction made by the astrologers about the Tiger King's death.", 'right_answer': "The astrologers predicted that the Tiger King would die by a tiger. They said that it was a secret that shouldn't be

revealed, but had to be spoken out. The Tiger King himself spoke as a ten-day-old infant and said that all those who are born will have to die, but there would be some sense if the astrologers could tell the manner of that death. This amazed everyone and the chief astrologer concluded that the death would come from the Tiger because the prince was born in the hour of the Bull and the Bull and the Tiger are enemies."},

{'question_number': 2, 'question': 'Explain why the Maharaja banned tiger hunting by anyone except himself and the consequences it led to.', 'right_answer': "The Maharaja banned tiger hunting by anyone except himself because of the astrologer's prediction that the hundredth tiger would be the most dangerous. He believed that if he killed the hundredth tiger, he would have to cut off his tuft, crop his hair short, and become an insurance agent. So, the Maharaja wanted to be the one to kill all the tigers. However, this led to a ban on tiger hunting for others and a proclamation was issued that anyone who harmed a tiger would have their wealth and property confiscated. This decision put the Maharaja at risk of losing his kingdom when a British officer visited and wanted to hunt tigers. To prevent this, the Maharaja sent expensive diamond rings to the British officer's wife, costing him three lakh of rupees but helping him retain his kingdom."},

{'question_number': 3, 'question': 'Discuss the events that took place when the Maharaja killed his first tiger.', 'right_answer': 'When the Maharaja killed his first tiger, he was thrilled and wanted to prove the astrologer wrong. He showed the dead beast to the State astrologer and asked for his opinion. The astrologer said that the Maharaja could kill ninety-nine tigers in the same manner, but had to be careful with the hundredth tiger. The Maharaja asked what would happen if he killed the hundredth tiger as well, to which the astrologer replied incoherently that he would tear up his books on astrology, set fire to them, and cut off his tuft and crop his hair short to become an insurance agent. This left the Maharaja amused and confident, thinking that he would kill all the tigers and prove the astrologer wrong.'},

{'question_number': 4, 'question': "Describe the impact of the Maharaja's decision to ban tiger hunting by anyone except himself and the consequences he faced.", 'right_answer': "The Maharaja's decision to ban tiger hunting by anyone except himself had a significant impact on the tigers in Pratibandapuram. It became a celebration time for the tigers as they were protected and anyone who harmed a

tiger would face severe consequences. The decision was made to fulfill the astrologer's prediction of the hundredth tiger being the most dangerous. However, this decision put the Maharaja at risk of losing his kingdom when a British officer visited and wanted to hunt tigers. The Maharaja stood firm in his resolve, refusing permission for the hunt and offering alternatives like boar hunt or mosquito hunt. To prevent the British officer from fulfilling his desire, the Maharaja sent expensive diamond rings to the officer's wife, resulting in a significant bill but helping him retain his kingdom."}},

{'question_number': 5, 'question': 'Reflect on the role of astrology and predictions in the life of the Tiger King.', 'right_answer': "Astrology and predictions played a significant role in the life of the Tiger King. The astrologers predicted right at the birth of the Tiger King that one day he would have to die. This prediction instilled a curiosity in the King to know the manner of his death. The astrologers also predicted that the death would come from a tiger, given that the prince was born in the hour of the Bull and the Bull and the Tiger are enemies. These predictions shaped the King's actions and ambitions as he set out on a mission to kill tigers and prove the astrologers wrong. The ban on tiger hunting by anyone except the King was also a consequence of the astrologer's prediction about the hundredth tiger. Overall, astrology and predictions had a profound impact on the decisions and destiny of the Tiger King."}}}

3. 1500 words

INPUT = It was in early March when the Secretary of the Examinations Board received the call from Oxford Prison. “It’s a slightly unusual request, Governor, but I don’t see why we shouldn’t try to help. Just the one fellow, you say?” “That’s it. Chap called Evans. Started night classes in O-level German last September. Says he’s dead keen to get some sort of academic qualification.” “Is he any good?” “He was the only one in the class, so you can say he’s had individual tuition all the time, really. Would have cost him a packet if he’d been outside.” “Well, let’s give him a chance, shall we?” “That’s jolly kind of you. What exactly’s the procedure now?” “Oh, don’t worry about that. I’ll be sending you all the forms and stuff. What’s his name, you say? Evans?” “James Roderick Evans.” It sounded rather grand. “Just one thing, Governor. He’s not a violent sort of fellow, is he? I don’t want to know his criminal record or anything like that, but — ” “No. There’s no record of violence. Quite a pleasant sort of chap, they tell me. Bit of a card, really. One of the stars at the Christmas concert. Imitations, you

know the sort of thing: Mike Yarwood stuff. No, he's just a congenital kleptomaniac, that's all." The Governor was tempted to add something else, but he thought better of it. He'd look after that particular side of things himself. "Presumably," said the Secretary, "you can arrange a room where — " "No problem. He's in a cell on his own. If you've no objections, he can sit the exam in there." "That's fine." "And we could easily get one of the parsons from St. Mary Mags to invigilate, if that's — " "Fine, yes. They seem to have a lot of parsons there, don't they?" The two men chuckled good-naturedly, and the Secretary had a final thought. "At least there's one thing. You shouldn't have much trouble keeping him incommunicado, should you?" The Governor chuckled politely once more, reiterated his thanks, and slowly cradled the phone. Evans! "Evans the Break" as the prison officers called him. Thrice he'd escaped from prison, and but for the recent wave of unrest in the maximum-security establishments up north, he wouldn't now be gracing the Governor's premises in Oxford; and the Governor was going to make absolutely certain that he wouldn't be disgracing them. Not that Evans was a real burden: just a persistent, nagging presence. He'd be all right in Oxford, though: the Governor would see to that — would see to it personally. And besides, there was just a possibility that Evans was genuinely interested in O-level German. Just a slight possibility. Just a very slight possibility. At 8.30 p.m. on Monday 7 June, Evans's German teacher shook him by the hand in the heavily guarded Recreational Block, just across from D Wing. "Guten Gluck, Herr Evans." "Pardon?" "I said, "Good luck". Good luck for tomorrow." "Oh. Thanks, er, I mean, er, Danke Schon." "You haven't a cat in hell's chance of getting through, of course, but — " "I may surprise everybody," said Evans. At 8.30 the following morning, Evans had a visitor. Two visitors, in fact. He tucked his grubby string-vest into his equally grubby trousers, and stood up from his bunk, smiling cheerfully. "Mornin", Mr Jackson. This is indeed an honour." Jackson was the senior prison officer on D Wing, and he and Evans had already become warm enemies. At Jackson's side stood Officer Stephens, a burly, surly-looking man, only recently recruited to the profession. Jackson nodded curtly. "And how's our little Einstein this morning, then?" "Wasn't 'e a mathematician, Mr Jackson?" "I think 'e was a Jew, Mr. Jackson." Evans's face was unshaven, and he wore a filthy-looking red-and-white bobble hat upon his head. "Give me a chance, Mr Jackson. I was just goin' to shave when you bust in." "Which reminds me." Jackson turned his eyes on Stephens. "Make sure you take his razor out of the cell when he's finished scraping that ugly mug of his. Clear? One of these days he'll do us all a favour and cut his bloody throat." For a few

seconds Evans looked thoughtfully at the man standing ramrod straight in front of him, a string of Second World War medals proudly paraded over his left breast-pocket. “Mr Jackson? Was it you who took my nail-scissors away?” Evans had always worried about his hands. “And your nail-file, too.” “Look!” For a moment Evans’s eyes smouldered dangerously, but Jackson was ready for him. “Orders of the Governor, Evans.” He leaned forward and leered, his voice dropping to a harsh, contemptuous whisper. “You want to complain?” Evans shrugged his shoulders lightly. The crisis was over. “You’ve got half an hour to smarten yourself up, Evans — and take that bloody hat off!” “Me ’at? Huh!” Evans put his right hand lovingly on top of the filthy woollen, and smiled sadly. “D’you know, Mr Jackson, it’s the only thing that’s ever brought me any sort o’ luck in life. Kind o’ lucky charm, if you know what I mean. And today I thought — well, with me exam and all that...” Buried somewhere in Jackson, was a tiny core of compassion; and Evans knew it. “Just this once, then, Shirley Temple.” (If there was one thing that Jackson genuinely loathed about Evans it was his long, wavy hair.) “And get shaving!” At 8.45 the same morning the Reverend Stuart McLeery left his bachelor flat in Broad Street and stepped out briskly towards Carfax. The weatherman reported temperatures considerably below the normal for early June, and a long black overcoat and a shallow-crowned clerical hat provided welcome protection from the steady drizzle which had set in half an hour earlier and which now spattered the thick lenses of his spectacles. In his right hand he was carrying a small brown suitcase, which contained all that he would need for his morning duties, including a sealed question paper envelope, a yellow invigilation form, a special “authentication” card from the Examinations Board, a paper knife, a Bible (he was to speak to the Women’s Guild that afternoon on the Book of Ruth), and a current copy of The Church Times. The two-hour examination was scheduled to start at 9.15 a.m. Evans was lathering his face vigorously when Stephens brought in two small square tables, and set them opposite each other in the narrow space between the bunk on the one side and on the other a distempered stone wall. Next, Stephens brought in two hard chairs, the slightly less battered of which he placed in front of the table which stood nearer the cell door. Jackson put in a brief final appearance. “Behave yourself, laddy!” Evans turned and nodded. “And these” — (Jackson pointed to the pin-ups) — “off!” Evans turned and nodded again. “I was goin’ to take ‘em down anyway. A minister, isn’t ’e? The chap comin’ to sit in, I mean.” “And how did you know that?” asked Jackson quietly. “Well, I ’ad to sign some forms, didn’t I? And I couldn’t ’elp — ” Evans drew the razor carefully down his left cheek, and left a

neat swath in the white lather. "Can I ask you something, Mr. Jackson? Why did they 'ave to bug me in this cell?" He nodded his head vaguely to a point above the door. "Not a very neat job," conceded Jackson. "They're not — they don't honestly think I'm goin' to try to —" "They're taking no chances, Evans. Nobody in his senses would take any chance with you." "Who's goin' to listen in?" "I'll tell you who's going to listen in, laddy. It's the Governor himself, see? He don't trust you a bloody inch — and nor do I. I'll be watching you like a hawk, Evans, so keep your nose clean. Clear?" He walked towards the door. Evans nodded. He'd already thought of that, and Number Two Handkerchief was lying ready on the bunk — a neatly folded square of off-white linen. "Just one more thing, Einstein." "Ya? Wha's 'at?" "Good luck, old son." In the little lodge just inside the prison's main gates, the Reverend S. McLeery signed his name neatly in the visitors' book, and thence walked side by side with a silent prison officer across the exercise yard to D Wing, where he was greeted by Jackson. The Wing's heavy outer door was unlocked, and locked behind them, the heavy inner door the same, and McLeery was handed into Stephens's keeping. "Get the razor?" murmured Jackson. Stephens nodded. "Well, keep your eyes skinned. Clear?" Stephens nodded again; and McLeery, his feet clanging up the iron stairs, followed his new guide, and finally stood before a cell door, where Stephens opened the peep-hole and looked through. "That's him, sir." Evans, facing the door, sat quietly at the farther of the two tables, his whole attention riveted to a textbook of elementary German grammar. Stephens took the key from its ring, and the cell lock sprang back with a thudded, metallic twang."""

OUTPUT =

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{'multiple_choice_questions': [
```

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{'question_number': 1, 'question': 'What was the reason for Evans being in prison?', 'option1': 'Violent crimes', 'option2': 'Multiple prison escapes', 'option3': 'Criminal record', 'option4': 'Congenital kleptomania', 'right_answer': 'Congenital kleptomania'},
```

```
{'question_number': 2, 'question': 'What academic qualification was Evans trying to achieve?', 'option1': 'O-level German', 'option2': 'PhD in Mathematics', 'option3': 'Master's degree in History', 'option4': 'Bachelor's degree in Chemistry', 'right_answer': 'O-level German'},
```

{'question_number': 3, 'question': "Who did the Governor mention as a possible invigilator for Evans' exam?", 'option1': 'A teacher from Oxford University', 'option2': 'A police officer', 'option3': 'A prison officer', 'option4': 'A parson from St. Mary Mags', 'right_answer': 'A parson from St. Mary Mags'},

{'question_number': 4, 'question': 'What did Jackson dislike about Evans?', 'option1': 'His long, wavy hair', 'option2': 'His criminal record', 'option3': 'His filthy clothing', 'option4': 'His constant smiling', 'right_answer': 'His long, wavy hair'},

{'question_number': 5, 'question': "Who was going to listen in on Evans' exam?", 'option1': 'The Secretary of the Examinations Board', 'option2': 'The Governor of Oxford Prison', 'option3': 'The Reverend Stuart McLeery', 'option4': 'Officer Stephens', 'right_answer': 'The Governor of Oxford Prison'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': "What was Evans' academic goal?", 'right_answer': 'O-level German'},

{'question_number': 2, 'question': "What was Evans' nickname among the prison officers?", 'right_answer': 'Evans the Break'},

{'question_number': 3, 'question': 'What was the occupation of the Reverend Stuart McLeery?', 'right_answer': 'Minister'},

{'question_number': 4, 'question': 'What did the Governor think Evans might be genuinely interested in?', 'right_answer': 'O-level German'},

{'question_number': 5, 'question': 'What did Evans ask Mr. Jackson about his nail-scissors?', 'right_answer': 'If he took them'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'Evans wanted to achieve an academic qualification in _____.', 'right_answer': 'O-level German'},

{'question_number': 2, 'question': 'The Governor mentioned that Evans was a _____.', 'right_answer': 'congenital kleptomaniac'},

{'question_number': 3, 'question': 'The Secretary of the Examinations Board suggested getting a parson from _____ to invigilate.', 'right_answer': 'St. Mary Mags'},

{'question_number': 4, 'question': 'Evans was nicknamed _____ by the prison officers.', 'right_answer': 'Evans the Break'},

{'question_number': 5, 'question': 'Officer Stephens took Evans' _____ away.', 'right_answer': 'razor'}], '

descriptive_type_questions': [{

'question_number': 1, 'question': '"Describe Evans' appearance when Officer Stephens brought in the tables and chairs."', 'right_answer': 'Evans had an unshaven face and wore a filthy-looking red-and-white bobble hat.'},

{'question_number': 2, 'question': 'What items did Reverend Stuart McLeery carry in his small brown suitcase?', 'right_answer': '"A sealed question paper envelope, a yellow invigilation form, a special 'authentication' card from the Examinations Board, a paper knife, a Bible, and a current copy of The Church Times.'"},

{'question_number': 3, 'question': 'Describe the prison cell where Evans sat for his exam.', 'right_answer': 'The cell had a bunk, a distempered stone wall, two small square tables, and two hard chairs.'},

{'question_number': 4, 'question': 'How did Jackson and Stephens ensure that Evans would not attempt to escape during the exam?', 'right_answer': 'They removed his razor and locked the cell doors.'},

{'question_number': 5, 'question': 'Describe the weather and the clothing Reverend Stuart McLeery wore on his way to the prison.', 'right_answer': 'The weather was a steady drizzle, and McLeery wore a long black overcoat and a shallow-crowned clerical hat for protection.'}}]

4. 1501 words

INPUT = Dr Sadao Hoki's house was built on a spot of the Japanese coast where as a little boy he had often played. The low, square stone house was set upon rocks well above a narrow beach that was outlined with bent pines. As a boy Sadao had climbed the pines, supporting himself on his bare feet, as he had seen men do in the South Seas when they climbed for coconuts. His father had taken him often to the islands of those seas, and never had he failed to say to the little brave boy at his side, "Those islands yonder, they are the stepping stones to the future for Japan." "Where shall we step from them?" Sadao had asked seriously. "Who knows?" his father had answered. "Who can limit our future? It depends on what we make it." Sadao had taken this into his mind as he did everything his father said, his father who never joked or played with him but who spent infinite pains upon him who was his only son. Sadao knew that his education was his father's chief concern. For this reason he had been sent at twenty-two to America to learn all that could be learned of surgery and medicine. He had come back at thirty, and before his father died he had seen Sadao become famous not only as a surgeon but as a scientist. Because he was perfecting a discovery which would render wounds entirely clean, he had not been sent abroad with the troops. Also, he knew, there was some slight danger that the old General might need an operation for a condition for which he was now being treated medically, and for this possibility Sadao was being kept in Japan. Clouds were rising from the ocean now. The unexpected warmth of the past few days had at night drawn heavy fog from the cold waves. Sadao watched mists hide outlines of a little island near the shore and then come creeping up the beach below the house, wreathing around the pines. In a few minutes fog would be wrapped about the house too. Then he would go into the room where Hana, his wife, would be waiting for him with the two children. But at this moment the door opened and she looked out, a dark-blue woollen haori over her kimono. She came to him affectionately and put her arm through his as he stood, smiled and said nothing. He had met Hana in America, but he had waited to fall in love with her until he was sure she was Japanese. His father would never have received her unless she had been pure in her race. He wondered often whom he would have married if he had not met Hana, and by what luck he had found her in the most casual way, by chance literally, at an American professor's house. The professor and his wife had been kind people anxious to do something for their few foreign students, and the students, though bored, had accepted this kindness. Sadao had often told Hana how nearly he had not gone to Professor Harley's house that night — the rooms were so small, the

food so bad, the professor's wife so voluble. But he had gone and there he had found Hana, a new student, and had felt he would love her if it were at all possible. Now he felt her hand on his arm and was aware of the pleasure it gave him, even though they had been married years enough to have the two children. For they had not married heedlessly in America. They had finished their work at school and had come home to Japan, and when his father had seen her the marriage had been arranged in the old Japanese way, although Sadao and Hana had talked everything over beforehand. They were perfectly happy. She laid her cheek against his arm. It was at this moment that both of them saw something black come out of the mists. It was a man. He was flung up out of the ocean — flung, it seemed, to his feet by a breaker. He staggered a few steps, his body outlined against the mist, his arms above his head. Then the curled mists hid him again. "Who is that?" Hana cried. She dropped Sadao's arm and they both leaned over the railing of the veranda. Now they saw him again. The man was on his hands and knees crawling. Then they saw him fall on his face and lie there. "A fisherman perhaps," Sadao said, "washed from his boat." He ran quickly down the steps and behind him 27The Enemy Hana came, her wide sleeves flying. A mile or two away on either side there were fishing villages, but here was only the bare and lonely coast, dangerous with rocks. The surf beyond the beach was spiked with rocks. Somehow the man had managed to come through them — he must be badly torn. They saw when they came toward him that indeed it was so. The sand on one side of him had already a stain of red soaking through. "He is wounded," Sadao exclaimed. He made haste to the man, who lay motionless, his face in the sand. An old cap stuck to his head soaked with sea water. He was in wet rags of garments. Sadao stopped, Hana at his side, and turned the man's head. They saw the face. "A white man!" Hana whispered. Yes, it was a white man. The wet cap fell away and there was his wet yellow hair, long, as though for many weeks it had not been cut, and upon his young and tortured face was a rough yellow beard. He was unconscious and knew nothing that they did for him. Now Sadao remembered the wound, and with his expert fingers he began to search for it. Blood flowed freshly at his touch. On the right side of his lower back Sadao saw that a gun wound had been reopened. The flesh was blackened with powder. Sometime, not many days ago, the man had been shot and had not been tended. It was bad chance that the rock had struck the wound. "Oh, how he is bleeding!" Hana whispered again in a solemn voice. The mists screened them now completely, and at this time of day no one came by. The fishermen had gone home and even the chance beachcombers would have considered the day at an

end. "What shall we do with this man?" Sadao muttered. But his trained hands seemed of their own will to be doing what they could to stanch the fearful bleeding. He packed the wound with the sea moss that strewed the beach. The man moaned with pain in his stupor but he did not awaken. "The best thing that we could do would be to put him back in the sea," Sadao said, answering himself. Now that the bleeding was stopped for the moment he stood up and dusted the sand from his hands. "Yes, undoubtedly that would be best," Hana said steadily. But she continued to stare down at the motionless man. "If we sheltered a white man in our house we should be arrested and if we turned him over as a prisoner, he would certainly die," Sadao said. "The kindest thing would be to put him back into the sea," Hana said. But neither of them moved. They were staring with a curious repulsion upon the inert figure. "What is he?" Hana whispered. "There is something about him that looks American," Sadao said. He took up the battered cap. Yes, there, almost gone, was the faint lettering. "A sailor," he said, "from an American warship." He spelled it out: "U.S. Navy." The man was a prisoner of war! "He has escaped." Hana cried softly, "and that is why he is wounded." "In the back," Sadao agreed. They hesitated, looking at each other. Then Hana said with resolution: "Come, are we able to put him back into the sea?" "If I am able, are you?" Sadao asked. "No," Hana said, "But if you can do it alone..." Sadao hesitated again. "The strange thing is," he said, "that if the man were whole I could turn him over to the police without difficulty. I care nothing for him. He is my enemy. All Americans are my enemy. And he is only a common fellow. You see how foolish his face is. But since he is wounded..." "You also cannot throw him back to the sea," Hana said. "Then there is only one thing to do. We must carry him into the house." "But the servants?" Sadao inquired. 29The Enemy "We must simply tell them that we intend to give him to the police — as indeed we must, Sadao. We must think of the children and your position. It would endanger all of us if we did not give this man over as a prisoner of war." "Certainly," Sadao agreed. "I would not think of doing anything else."""

OUTPUT = {'multiple_choice_questions': [

{ 'question_number': 1, 'question': "Where was Dr. Sadao Hoki's house built?", 'option1': 'In a fishing village', 'option2': 'On a Japanese coast', 'option3': 'On an island', 'option4': 'In a city', 'right_answer': 'On a Japanese coast'},

{'question_number': 2, 'question': "What was Sadao's father's main concern?", 'option1': "Sadao's education", 'option2': "Sadao's marriage", 'option3': "Sadao's career", 'option4': "Sadao's health", 'right_answer': "Sadao's education"},

{'question_number': 3, 'question': 'What was Sadao famous for?', 'option1': 'Being a surgeon', 'option2': 'Being a scientist', 'option3': 'Being a musician', 'option4': 'Being an athlete', 'right_answer': 'Being a surgeon'},

{'question_number': 4, 'question': 'Why was Sadao being kept in Japan?', 'option1': 'To avoid danger', 'option2': 'To take care of his father', 'option3': 'To work on his discovery', 'option4': 'To be with his family', 'right_answer': 'To take care of his father'},

{'question_number': 5, 'question': 'What did Sadao and Hana find on the beach?', 'option1': 'A wounded fisherman', 'option2': 'A lost sailor', 'option3': 'A dead body', 'option4': 'A stranded tourist', 'right_answer': 'A wounded fisherman'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': "What was Sadao's father's chief concern?", 'right_answer': 'education'},

{'question_number': 2, 'question': 'What did Sadao become famous for?', 'right_answer': 'surgeon'},

{'question_number': 3, 'question': 'Why was Sadao being kept in Japan?', 'right_answer': "father's condition"},

{'question_number': 4, 'question': 'What did Sadao find on the beach?', 'right_answer': 'wounded man'},

{'question_number': 5, 'question': "What was Sadao's profession?", 'right_answer': 'doctor'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': "Dr. Sadao Hoki's house was built on a spot of the Japanese _____ where as a little boy he had often played.", 'right_answer': 'coast'},

{'question_number': 2, 'question': "Sadao's father had taken him often to the _____ of the South Seas.", 'right_answer': 'islands'},

{'question_number': 3, 'question': 'Sadao had been sent to America to learn all that could be learned of _____ and medicine.', 'right_answer': 'surgery'},

{'question_number': 4, 'question': "Sadao's father had seen him become famous not only as a surgeon but as a _____.", 'right_answer': 'scientist'},

{'question_number': 5, 'question': 'The unexpected warmth of the past few days had drawn heavy fog from the _____.', 'right_answer': 'waves'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': "Describe Sadao Hoki's house and its location.", 'right_answer': 'The house is a low, square stone house on rocks above a narrow beach. It is outlined with bent pines. It is located on a spot of the Japanese coast where Sadao used to play as a little boy.'},

{'question_number': 2, 'question': "Explain why Sadao's education was his father's main concern.", 'right_answer': "Sadao's father wanted him to have a good education, especially in the field of medicine. He believed that education is the stepping stone to the future for Japan and that Sadao's future success depended on his education."},

{'question_number': 3, 'question': "Discuss Sadao's profession and his achievements.", 'right_answer': 'Sadao is a renowned surgeon and scientist. He has made significant contributions to the field of medicine, particularly in the development of a discovery that renders wounds clean. His expertise and dedication have earned him fame and recognition.'},

{'question_number': 4, 'question': 'Describe the encounter of Sadao and Hana with the wounded man on the beach.', 'right_answer': 'Sadao and Hana find a wounded

man on the beach. They initially consider putting him back into the sea, but upon realizing he is a white man and a prisoner of war, they decide to bring him into their house. They discuss the implications and risks involved but ultimately choose to help him.'},

{'question_number': 5, 'question': 'Explain the dilemma faced by Sadao and Hana regarding the wounded man.', 'right_answer': "Sadao and Hana are torn between their allegiance to Japan and their compassion for the wounded man. They know that sheltering him in their house could lead to serious consequences, but they also struggle with the idea of handing him over as a prisoner of war. Their decision ultimately revolves around the man's condition and their moral obligation to help."}}}

5. 1400 words

INPUT = In the evenings and for Saturday naps like today's, Jack told his daughter Jo a story out of his head. This custom, begun when she was two, was itself now nearly two years old, and his head felt empty. Each new story was a slight variation of a basic tale: a small creature, usually named Roger (Roger Fish, Roger Squirrel, Roger Chipmunk), had some problem and went with it to the wise old owl. The owl told him to go to the wizard, and the wizard performed a magic spell that solved the problem, demanding in payment a number of pennies greater than the number that Roger Creature had, but in the same breath directing the animal to a place where the extra pennies could be found. Then Roger was so happy he played many games with other creatures, and went home to his mother just in time to hear the train whistle that brought his daddy home from Boston. Jack described their supper, and the story was over. Working his way through this scheme was especially fatiguing on Saturday, because Jo never fell asleep in naps any more, and knowing this made the rite seem futile. The little girl (not so little any more; the bumps her feet made under the covers were halfway down the bed, their big double bed that they let her be in for naps and when she was sick) had at last arranged herself, and from the way her fat face deep in the pillow shone in the sunlight sifting through the drawn shades, it did not seem fantastic that some magic would occur, and she would take her nap like an infant of two. Her brother, Bobby, was two, and already asleep with his bottle. Jack asked, "Who shall the story be about today?" "Roger..." Jo squeezed her eyes shut and smiled to be thinking she was thinking. Her eyes opened, her mother's blue. "Skunk," she said firmly. A new animal; they must talk about skunks at nursery

school. Having a fresh hero momentarily stirred Jack to creative enthusiasm. “All right,” he said. “Once upon a time, in the deep dark woods, there was a tiny little creature by the name of Roger Skunk. And he smelled very bad.” “Yes,” Jo said. “He smelled so bad that none of the other little woodland creatures would play with him.” Jo looked at him solemnly; she hadn’t foreseen this. “Whenever he would go out to play,” Jack continued with zest, remembering certain humiliations of his own childhood, “all of the other tiny animals would cry, “Uh-oh, here comes Roger Stinky Skunk,” and they would run away, and Roger Skunk would stand there all alone, and two little round tears would fall from his eyes.” The corners of Jo’s mouth drooped down and her lower lip bent forward as he traced with a forefinger along the side of her nose the course of one of Roger Skunk’s tears. “Won’t he see the owl?” she asked in a high and faintly roughened voice. Sitting on the bed beside her, Jack felt the covers tug as her legs switched tensely. He was pleased with this moment — he was telling her something true, something she must know — and had no wish to hurry on. But downstairs a chair scraped, and he realised he must get down to help Clare paint the living-room woodwork. “Well, he walked along very sadly and came to a very big tree, and in the tiptop of the tree was an enormous wise old owl.” “Good.” “Mr Owl,” Roger Skunk said, “all the other little animals run away from me because I smell so bad.” “So you do,” the owl said. “Very, very bad.” “What can I do?” Roger Skunk said, and he cried very hard. “The wizard, the wizard,” Jo shouted, and sat right up, and a Little Golden Book spilled from the bed. “Now, Jo. Daddy’s telling the story. Do you want to tell Daddy the story?” “No. You me.” “Then lie down and be sleepy.” Her head relapsed onto the pillow and she said, “Out of your head.” “Well. The owl thought and thought. At last he said, “Why don’t you go see the wizard?” “Daddy?” “What?” “Are magic spells real?” This was a new phase, just this last month, a reality phase. When he told her spiders eat bugs, she turned to her mother and asked, “Do they really?” and when Clare told her God was in the sky and all around them, she turned to her father and insisted, with a sly yet eager smile, “Is He really?” “They’re real in stories,” Jack answered curtly. She had made him miss a beat in the narrative. “The owl said, “Go through the dark woods, under the apple trees, into the swamp, over the crick —” “What’s a crick?” A little river. “Over the crick, and there will be the wizard’s house.” And that’s the way Roger Skunk went, and pretty soon he came to a little white house, and he rapped on the door.” Jack rapped on the window sill, and under the covers Jo’s tall figure clenched in an infantile thrill. “And then a tiny little old man came out, with a long white beard and a pointed blue hat, and said, “Eh? Whatzis?

Whatcher want? You smell awful.” The wizard’s voice was one of Jack’s own favourite effects; he did it by scrunching up his face and somehow whining through his eyes, which felt for the interval rheumy. He felt being an old man suited him. “I know it,” Roger Skunk said, “and all the little animals run away from me. The enormous wise owl said you could help me.” “Eh? Well, maybe. Come on in. Don’t get too close.” Now, inside, Jo, there were all these magic things, all jumbled together in a big dusty heap, because the wizard did not have any cleaning lady.” “Why?” “Why? Because he was a wizard, and a very old man.” “Will he die?” “No. Wizards don’t die. Well, he rummaged around and found an old stick called a magic wand and asked Roger Skunk what he wanted to smell like. Roger thought and thought and said, “Roses.” “Yes. Good,” Jo said smugly. Jack fixed her with a trance like gaze and chanted in the wizard’s elderly irritable voice: “Abracadabry, hocus-poo, Roger Skunk, how do you do, Roses, boses, pull an ear, Roger Skunk, you never fear: Bingo!” He paused as a rapt expression widened out from his daughter’s nostrils, forcing her eyebrows up and her lower lip down in a wide noiseless grin, an expression in which Jack was startled to recognise his wife feigning pleasure at cocktail parties. “And all of a sudden,” he whispered, “the whole inside of the wizard’s house was full of the smell of — roses! ‘Roses!’ Roger Fish cried. And the wizard said, very cranky, “That’ll be seven pennies.” “Daddy.” “What?” “Roger Skunk. You said Roger Fish.” “Yes. Skunk.” “You said Roger Fish. Wasn’t that silly?” “Very silly of your stupid old daddy. Where was I? Well, you know about the pennies.” “Say it.” “O.K. Roger Skunk said, ‘But all I have is four pennies,’ and he began to cry.” Jo made the crying face again, but this time without a trace of sincerity. This annoyed Jack. Downstairs some more furniture rumbled. Clare shouldn’t move heavy things; she was six months pregnant. It would be their third. “So the wizard said, ‘Oh, very well. Go to the end of the lane and turn around three times and look down the magic well and there you will find three pennies. Hurry up.’ So Roger Skunk went to the end of the lane and turned around three times and there in the magic well were three pennies! So he took them back to the wizard and was very happy and ran out into the woods and all the other little animals gathered around him because he smelled so good. And they played tag, baseball, football, basketball, lacrosse, hockey, soccer, and pick-up-sticks.” “What’s pick-up-sticks?” “It’s a game you play with sticks.” “Like the wizard’s magic wand?” “Kind of. And they played games and laughed all afternoon and then it began to get dark and they all ran home to their mommies.” ""

OUTPUT =

```
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  {'question_number': 1, 'question': 'What is the name of the small creature in the  
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  Chipmunk', 'option4': 'Roger Skunk', 'right_answer': 'Roger Skunk'},
```

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  {'question_number': 2, 'question': 'Who does Roger Skunk go to for help?',  
  'option1': 'The wizard', 'option2': 'The owl', 'option3': 'Jack', 'option4': 'Jo',  
  'right_answer': 'The wizard'},
```

```
  {'question_number': 3, 'question': 'How does Roger Skunk solve his problem?',  
  'option1': 'By finding extra pennies', 'option2': 'By making new friends', 'option3':  
  'By changing his name', 'option4': 'By taking a bath', 'right_answer': 'By finding  
  extra pennies'},
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```
  {'question_number': 4, 'question': 'What does Jo want Roger Skunk to smell like?',  
  'option1': 'Roses', 'option2': 'Lavender', 'option3': 'Vanilla', 'option4': 'Chocolate',  
  'right_answer': 'Roses'},
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```
  {'question_number': 5, 'question': 'What games do Roger Skunk and the other  
  animals play together?', 'option1': 'Tag, baseball, and football', 'option2':  
  'Basketball, lacrosse, and hockey', 'option3': 'Soccer and pick-up-sticks', 'option4':  
  'All of the above', 'right_answer': 'All of the above'}],
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'single_word_answer_type_questions': [  

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  'right_answer': 'The wizard'},
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  'right_answer': 'Roses'},
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  {'question_number': 3, 'question': 'Where does Roger Skunk find the extra  
  pennies?', 'right_answer': 'In the magic well'},
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  {'question_number': 4, 'question': 'Who does Roger Skunk play games with?',  
  'right_answer': 'Other animals'},
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{'question_number': 5, 'question': 'Who tells the stories to Jo?', 'right_answer': 'Jack'}},

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'Roger Skunk went to the _____ to solve his problem.', 'right_answer': 'wizard'}},

{'question_number': 2, 'question': 'Jo wanted Roger Skunk to smell like _____', 'right_answer': 'roses'}},

{'question_number': 3, 'question': 'Roger Skunk found three extra pennies in the _____', 'right_answer': 'magic well'}},

{'question_number': 4, 'question': 'Roger Skunk played games with _____', 'right_answer': 'other animals'}},

{'question_number': 5, 'question': 'Jack was the one who told the _____ to Jo.', 'right_answer': 'stories'}},

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Describe the basic tale of the stories that Jack tells Jo.', 'right_answer': 'A small creature named Roger has some problem, goes to the wise old owl, who directs him to the wizard. The wizard performs a magic spell to solve the problem, but demands more pennies from Roger. Roger finds extra pennies and becomes happy. He then plays games with other creatures and goes home to his mother.'}},

{'question_number': 2, 'question': 'How does Roger Skunk feel when the other animals run away from him?', 'right_answer': 'He feels sad and two little round tears fall from his eyes.'}},

{'question_number': 3, 'question': '"Describe the wizard's house and the things inside it."', 'right_answer': '"The wizard's house is a little white house filled with

jumbled magic things. It is dusty because the wizard doesn't have a cleaning lady."}},

{'question_number': 4, 'question': "What does Jack do to imitate the wizard's voice?", 'right_answer': 'He scrunches up his face and whines through his eyes.'},

{'question_number': 5, 'question': 'Why does Roger Skunk become happy after visiting the wizard?', 'right_answer': 'Because he smells good and the other animals want to play with him.'}}}

6. 650 words

INPUT = Six hundred and fifty million years ago, a giant amalgamated southern supercontinent — Gondwana — did indeed exist, centred roughly around the present-day 19Journey to the end of the Earth Antarctica. Things were quite different then: humans hadn't arrived on the global scene, and the climate was much warmer, hosting a huge variety of flora and fauna. For 500 million years Gondwana thrived, but around the time when the dinosaurs were wiped out and the age of the mammals got under way, the landmass was forced to separate into countries, shaping the globe much as we know it today. To visit Antarctica now is to be a part of that history; to get a grasp of where we've come from and where we could possibly be heading. It's to understand the significance of Cordilleran folds and pre-Cambrian granite shields; ozone and carbon; evolution and extinction. When you think about all that can happen in a million years, it can get pretty mind-boggling. Imagine: India pushing northwards, jamming against Asia to buckle its crust and form the Himalayas; South America drifting off to join North America, opening up the Drake Passage to create a cold circumpolar current, keeping Antarctica frigid, desolate, and at the bottom of the world. For a sun-worshipping South Indian like myself, two weeks in a place where 90 per cent of the Earth's total ice volumes are stored is a chilling prospect (not just for circulatory and metabolic functions, but also for the imagination). It's like walking into a giant ping-pong ball devoid of any human markers — no trees, billboards, buildings. You lose all earthly sense of perspective and time here. The visual scale ranges from the microscopic to the mighty: midges and mites to blue whales and icebergs as big as countries (the largest recorded was the size of Belgium). Days go on and on and on in surreal 24-hour austral summer light, and a ubiquitous silence, interrupted only by the occasional avalanche or calving ice sheet, consecrates the place. It's an immersion that will force you to place

yourself in the context of the earth's geological history. And for humans, the prognosis isn't good. 20 Vistas devoid of any human markers — no trees, billboards, buildings. You lose all earthly sense of perspective and time here. The visual scale ranges from the microscopic to the mighty: midges and mites to blue whales and icebergs as big as countries (the largest recorded was the size of Belgium). Days go on and on and on in surreal 24-hour austral summer light, and a ubiquitous silence, interrupted only by the occasional avalanche or calving ice sheet, consecrates the place. It's an immersion that will force you to place yourself in the context of the earth's geological history. And for humans, the prognosis isn't good. Human civilisations have been around for a paltry 12,000 years — barely a few seconds on the geological clock. In that short amount of time, we've managed to create quite a ruckus, etching our dominance over Nature with our villages, towns, cities, megacities. The rapid increase of human populations has left us battling with other species for limited resources, and the unmitigated burning of fossil fuels has now created a blanket of carbon dioxide around the world, which is slowly but surely increasing the average global temperature. Climate change is one of the most hotly contested environmental debates of our time. Will the West Antarctic ice sheet melt entirely? Will the Gulf Stream ocean current be disrupted? Will it be the end of the world as we know it? Maybe. Maybe not. Either way, Antarctica is a crucial element in this debate — not just because it's the only place in the world, which has never sustained a human population and therefore remains relatively 'pristine' in this respect; but more importantly, because it holds in its ice-cores half-million-year-old carbon records trapped in its layers of ice. If we want to study and examine the Earth's past, present and future, Antarctica is the place to go."""

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'Approximately how many years ago did the giant supercontinent Gondwana exist?', 'option1': '100 million', 'option2': '500 million', 'option3': '650 million', 'option4': '1 billion', 'right_answer': '650 million'},

{'question_number': 2, 'question': 'During the time of Gondwana, what was the climate like?', 'option1': 'Cold and desolate', 'option2': 'Moderate and pleasant', 'option3': 'Hot and humid', 'option4': 'Warm and diverse', 'right_answer': 'Hot and humid'},

{'question_number': 3, 'question': 'What caused the separation of Gondwana into different countries?', 'option1': 'Dinosaurs', 'option2': 'Mammals', 'option3': 'Humans', 'option4': 'Plate tectonics', 'right_answer': 'Plate tectonics'}},

{'question_number': 4, 'question': 'What forces shaped the globe as we know it today?', 'option1': 'Evolution and extinction', 'option2': 'Cordilleran folds and pre-Cambrian granite shields', 'option3': 'Ozone and carbon', 'option4': 'All of the above', 'right_answer': 'All of the above'}},

{'question_number': 5, 'question': 'What is the significance of India pushing northwards and jamming against Asia?', 'option1': 'Formation of the Himalayas', 'option2': 'Creation of cold circumpolar current', 'option3': 'Formation of the Drake Passage', 'option4': 'Creation of carbon records', 'right_answer': 'Formation of the Himalayas'}}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What geological period did Gondwana exist in?', 'right_answer': 'pre-Cambrian'}},

{'question_number': 2, 'question': 'What is the current average global temperature increasing due to?', 'right_answer': 'burning of fossil fuels'}},

{'question_number': 3, 'question': 'What is the main reason that Antarctica is a crucial element in the climate change debate?', 'right_answer': 'half-million-year-old carbon records trapped in its ice'}},

{'question_number': 4, 'question': 'How long has human civilization been around in comparison to the geological clock?', 'right_answer': '12,000 years'}},

{'question_number': 5, 'question': 'What is the potential consequence of the West Antarctic ice sheet melting entirely?', 'right_answer': 'end of the world'}}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'Approximately __ years ago, the giant supercontinent Gondwana existed.', 'right_answer': '650 million'},

{'question_number': 2, 'question': 'Antarctica holds __-year-old carbon records trapped in its layers of ice.', 'right_answer': 'half-million'},

{'question_number': 3, 'question': 'Human civilization has been around for __ years.', 'right_answer': '12,000'},

{'question_number': 4, 'question': 'The rapid increase of human populations has left us battling with other species for __ resources.', 'right_answer': 'limited'},

{'question_number': 5, 'question': 'Will the __ ocean current be disrupted?', 'right_answer': 'Gulf Stream'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Describe the climate during the time of Gondwana.', 'right_answer': 'The climate during the time of Gondwana was hot and humid, hosting a huge variety of flora and fauna.'},

{'question_number': 2, 'question': 'Explain the significance of Cordilleran folds and pre-Cambrian granite shields.', 'right_answer': "The Cordilleran folds and pre-Cambrian granite shields played a major role in shaping the earth's geological history, contributing to the formation of mountains and continents."},

{'question_number': 3, 'question': 'Discuss the potential consequences of the West Antarctic ice sheet melting entirely.', 'right_answer': 'If the West Antarctic ice sheet melts entirely, it could lead to a significant rise in sea levels, affecting coastal regions and causing environmental and ecological disruptions.'},

{'question_number': 4, 'question': "Explain the role of Antarctica in studying the Earth's past, present, and future.", 'right_answer': "Antarctica is a crucial location for studying the Earth's history as it holds ancient carbon records trapped in its ice. By analyzing these records, scientists can gain insights into climate change, evolution, and future environmental trends."},

{'question_number': 5, 'question': 'Discuss the impact of human civilization on the environment.', 'right_answer': 'Human civilization, in its short existence, has caused significant environmental changes. The burning of fossil fuels and rapid population growth have led to climate change and resource depletion, posing challenges for the future of the planet.'}}

7. 651 words

INPUT = Nikola Tesla is regarded as one of history's most influential inventors, with discoveries in the area of electricity that were far ahead of their time and continue to have an impact on technology today. Tesla died penniless and without the acclaim that he would eventually receive over a century later, despite his achievements. Tesla's career as an inventor began early; at the age of 26, he is said to have sketched up the concepts for a rotating magnetic field while working at the Central Telegraph Office in Budapest, an essential innovation that is currently employed in many electromechanical devices. This huge breakthrough paved the way for many of his other innovations, including the alternating current motor, and eventually brought him to New York City in 1884, where he was drawn by Thomas Edison and his groundbreaking engineering firm, Edison Machine Works. The “genius who illuminated the world” is now memorialised with an electrical unit known as the Tesla, as well as streets, statues, and a prominent engineer's award in his honour, but he wasn't always so successful in life. But Tesla was a scientist, who had deep theories always in mind. Let's discuss Nikola Tesla Information here completely. Nikola Tesla was born in 1856 in the town of Smiljan, which is now part of Croatia but was once part of the Austro-Hungarian Empire. His father was a priest, while his mother, despite her lack of formal education, worked with machinery and was known for her incredible memory. Keep reading the article for the entire Nikola Tesla biography. Tesla's family relocated to nearby Gospi in 1862, where Tesla's father served as a parish priest. Nikola finished primary school and then moved on to middle school. Tesla travelled to Karlovac in 1870 to attend the Higher Real Gymnasium, where classes were taught in German, as was the case throughout the Austro-Hungarian Military Frontier. Tesla later wrote that his physics professor sparked his interest in electricity demonstrations. These displays of this "mystery phenomenon" made Tesla want to "know more about this wonderful power," he said. Tesla's ability to complete integral calculus in his mind led his teachers to suspect he was cheating. He graduated in 1873 after completing a four-year term in three years. Tesla

returned to Smiljan in 1873. He developed cholera shortly after arriving, was bedridden for nine months, and came close to death several times. Tesla's father pledged to send him to the top engineering school if he recovered from his illness in a time of despair. Tesla escaped conscription into the Austro-Hungarian Army in Smiljan in 1874 by fleeing to Tomingaj, southeast of Lika. He went there dressed as a hunter and explored the mountains. Tesla claimed that his contact with nature made him physically and intellectually stronger. While at Tomingaj, he studied a lot of books and later claimed that Mark Twain's works had miraculously helped him recover from his former illness. Tesla received a Military Frontier scholarship to the Imperial-Royal Technical College in Graz in 1875. Tesla never missed a lecture during his first year, obtained the highest marks possible, passed nine tests, founded a Serb cultural society, and even received a letter of congratulations from the dean of the technical college to his father, stating, "Your son is a star of the first rank." Professor Jakob Pöschl's thorough lectures on electricity enthralled Tesla while he was in Graz. Tesla discovered, designed, and developed ideas for a number of significant innovations, the majority of which were officially patented by other inventors, including dynamos (electrical generators comparable to batteries) and the induction motor, over the course of his career. He was also a pioneer in the development of radar, X-ray, remote control, and the rotating magnetic field, which is the foundation of most AC machinery. Tesla is most recognised for his contributions to AC power and the Tesla coil, which he invented. ""

OUTPUT =

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{'question_number': 1, 'question': 'Where was Nikola Tesla born?', 'option1': 'Croatia', 'option2': 'Hungary', 'option3': 'Austria', 'option4': 'Serbia', 'right_answer': 'Croatia'},
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```
{'question_number': 2, 'question': 'At what age did Tesla sketch up the concepts for a rotating magnetic field?', 'option1': '19', 'option2': '26', 'option3': '33', 'option4': '41', 'right_answer': '26'},
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{'question_number': 3, 'question': 'Which invention is Nikola Tesla most recognized for?', 'option1': 'Alternating current motor', 'option2': 'Tesla coil', 'option3': 'X-ray', 'option4': 'Remote control', 'right_answer': 'Tesla coil'},

{'question_number': 4, 'question': 'Where did Nikola Tesla attend the Higher Real Gymnasium?', 'option1': 'Smiljan', 'option2': 'Tomingaj', 'option3': 'Karlovac', 'option4': 'Gospi', 'right_answer': 'Karlovac'},

{'question_number': 5, 'question': 'Which professor sparked Nikola Tesla's interest in electricity demonstrations?', 'option1': 'Thomas Edison', 'option2': 'Jakob Pöschl', 'option3': 'Mark Twain', 'option4': 'None of the above', 'right_answer': 'Jakob Pöschl'}],

'single_word_answer_type_questions': [

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{'question_number': 2, 'question': 'In which year was Nikola Tesla born?', 'right_answer': '1856'},

{'question_number': 3, 'question': 'Where did Nikola Tesla escape from conscription into the Austro-Hungarian Army?', 'right_answer': 'Smiljan'},

{'question_number': 4, 'question': 'What was Tesla's career as an inventor known for?', 'right_answer': 'Discoveries in the area of electricity'},

{'question_number': 5, 'question': 'What is the foundation of most AC machinery?', 'right_answer': 'Rotating magnetic field'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'Tesla's father pledged to send him to the top engineering school if he recovered from his _____.', 'right_answer': 'illness'},

{'question_number': 2, 'question': 'Tesla developed cholera shortly after arriving in _____.', 'right_answer': 'Smiljan'},

{'question_number': 3, 'question': 'Tesla studied a lot of books while in _____.', 'right_answer': 'Tomingaj'},

{'question_number': 4, 'question': 'Tesla received a Military Frontier scholarship to the Imperial-Royal Technical College in _____.', 'right_answer': 'Graz'},

{'question_number': 5, 'question': 'Tesla is most recognized for his contributions to AC power and the _____.', 'right_answer': 'Tesla coil'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': "Discuss Nikola Tesla's early career and innovations.", 'right_answer': "Nikola Tesla's career as an inventor began at the age of 26 when he sketched up the concepts for a rotating magnetic field. This innovation led to many of his other inventions, including the alternating current motor. Tesla's contributions to electricity and technology continue to have an impact today."},

{'question_number': 2, 'question': "Describe Nikola Tesla's childhood and education.", 'right_answer': "Nikola Tesla was born in Smiljan, which is now part of Croatia. His mother worked with machinery and his physics professor sparked his interest in electricity demonstrations. Tesla attended the Higher Real Gymnasium in Karlovac and later received a scholarship to the Imperial-Royal Technical College in Graz. Despite facing challenges, Tesla's passion for science and engineering propelled him to great achievements."},

{'question_number': 3, 'question': "Explain the significance of Nikola Tesla's inventions and contributions to technology.", 'right_answer': "Nikola Tesla's inventions, such as the Tesla coil and AC power, have had a profound impact on technology. His discoveries in the area of electricity paved the way for many advancements and continue to shape our modern world. Tesla's ability to think outside the box and his commitment to scientific exploration made him one of history's most influential inventors."},

{'question_number': 4, 'question': "Discuss Nikola Tesla's impact on the field of electricity.", 'right_answer': "Nikola Tesla's groundbreaking work in the field of

electricity revolutionized the industry. His discovery of the rotating magnetic field and his contributions to AC power laid the foundation for the modern electrical systems we use today. Tesla's inventions and innovations continue to shape our lives and his legacy as a brilliant scientist and inventor is undeniable."},

{'question_number': 5, 'question': "Describe Nikola Tesla's journey from obscurity to recognition.", 'right_answer': "Despite his incredible achievements, Nikola Tesla faced many challenges and lived much of his life in obscurity. It was not until many years after his death that he gained the recognition he deserved for his contributions to science and technology. Today, Tesla is regarded as one of history's greatest inventors and his name lives on in the Tesla electric car and numerous other memorials dedicated to his genius."}}

8. 600 words

INPUT = Albert Einstein was a Theoretical Physicist of German origin. He is the one who developed a pillar of modern Physics, the Theory of Relativity. Be it his mass-energy equivalence formula or his law of photoelectric effect, the theories he postulated changed the history of science forever. His works are still studied in standard institutions of learning throughout the world. lbert Einstein was born on 14th March 1879 in Ulm in the Kingdom of Wurttemberg in the German empire. His father's name was Herman Einstein and his mother's name was Pauline Koch. His father worked as a salesman and as an engineer. In 1880, his father along with his family moved to Munich. His father and his uncle founded Elektrotechnische Fabrik J. Einstein & Cie. It is a company that manufactures electrical equipment based on direct current. After birth, Albert Einstein's head was much larger than his body and he was born as a deformed abnormal child. Usually, children start speaking at the age of 2, but Albert Einstein started speaking after 4 years of age. When Einstein was 5 years old, his father gifted him with a magnetic compass on his birthday. The needle of the compass used to be in the North Direction, and seeing this, he became very fascinated and developed an interest to explore science well. Albert Einstein was born on 14th March 1879, in Ulm, where his family ran a small shop. He had two siblings, an elder sister named Maja and a younger brother named Hans Albert. The Einsteins were non-observant Jews and moved to Munich when Albert was one year old. His parents wanted him to become a businessman, but he showed scientific inclinations from his childhood days. From 1890, the family resided in Milan where Einstein underwent Technical High School education. Since his father had relocated to Italy for work purposes, Albert

Einstein decided not to move with his family to Berlin after matriculating from the Zurich Polytechnic in 1896. He had problems with authority and left his academic institutions without a degree on several occasions. He started working as a patent clerk at the Swiss Patent Office in 1902, where he spent most of his time on theoretical physics. In 1905, he published four papers that revolutionized Physics. They were on (i) Brownian motion, (ii) photoelectric effect, (iii) special relativity and (iv) equivalence of mass and energy, which is famously known as the $E=mc^2$ equation. He worked on unified field Theory for more than ten years but was unable to complete it. At the age of 5, he joined the Catholic Elementary School in Munich. After that, he enrolled in Luitpold Gymnasium, where he received his primary and secondary school education. When Albert Einstein was 15 years old, his father wanted him to do electrical engineering but Einstein used to fight with the authority of his school, about their way of teaching. He believed that due to so many strict rules and regulations in the school, the creative mind of children was lost and they only knew the strict rote learning. Einstein was thrown out of school too many times due to this behavior of his. He used to fight with his teachers, he also raised questions about their way of teaching. At the age of 12, Einstein started learning Calculus on his own, and when he became 14 years old, he mastered Integral and Differential Calculus. Einstein got married in 1903 to Marci. In 1904 his son named Hans Albert Einstein was born, and in 1910 his second son Eduard was born. ""

OUTPUT =

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{'question_number': 1, 'question': 'In which country was Albert Einstein born?',  
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'right_answer': 'Germany'},
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```
{'question_number': 2, 'question': 'Which theory is Albert Einstein most famous  
for?', 'option1': 'Theory of Gravity', 'option2': 'Atomic Theory', 'option3': 'Theory  
of Relativity', 'option4': 'Quantum Theory', 'right_answer': 'Theory of Relativity'},
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```
{'question_number': 3, 'question': 'What formula is famously associated with  
Albert Einstein?', 'option1': 'E=mc2', 'option2': 'F=ma', 'option3': 'PV=nRT',  
'option4': 'H2O', 'right_answer': 'E=mc2'},
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{'question_number': 4, 'question': 'Where did Albert Einstein work as a patent clerk?', 'option1': 'Germany', 'option2': 'Switzerland', 'option3': 'Italy', 'option4': 'Austria', 'right_answer': 'Switzerland'},

{'question_number': 5, 'question': 'Which field did Albert Einstein work on for more than ten years?', 'option1': 'Nuclear Physics', 'option2': 'Quantum Mechanics', 'option3': 'Unified Field Theory', 'option4': 'Particle Physics', 'right_answer': 'Unified Field Theory'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': "What is the full name of Albert Einstein's father?", 'right_answer': 'Herman Einstein'},

{'question_number': 2, 'question': "Which city did Albert Einstein's family move to when he was one year old?", 'right_answer': 'Munich'},

{'question_number': 3, 'question': "What profession did Albert Einstein's parents want him to pursue?", 'right_answer': 'Businessman'},

{'question_number': 4, 'question': "What was Albert Einstein's occupation when he published his four groundbreaking papers in 1905?", 'right_answer': 'Patent clerk'},

{'question_number': 5, 'question': 'What subject did Albert Einstein fight with his school authority about?', 'right_answer': 'Teaching methods'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'Albert Einstein was born on _____ March 1879.', 'right_answer': '14th'},

{'question_number': 2, 'question': "Albert Einstein's father worked as a _____ and _____.", 'right_answer': 'salesman, engineer'},

{'question_number': 3, 'question': 'Albert Einstein became fascinated with science when he received a _____ on his birthday.', 'right_answer': 'magnetic compass'},

{'question_number': 4, 'question': 'Albert Einstein's family moved to _____ when he was one year old.', 'right_answer': 'Munich'},

{'question_number': 5, 'question': 'Albert Einstein started working as a patent clerk at the _____ Patent Office in 1902.', 'right_answer': 'Swiss'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': "Describe Albert Einstein's professional background and his major contributions to physics.", 'right_answer': "Albert Einstein was a theoretical physicist who revolutionized the field of physics with his theory of relativity. His mass-energy equivalence formula, $E=mc^2$, is one of the most famous equations in the world. He also made significant contributions to the understanding of the photoelectric effect and Brownian motion. Einstein's works have had a profound impact on the development of modern physics and his theories continue to be studied and applied today."},

{'question_number': 2, 'question': "Discuss Albert Einstein's early life and education, including any challenges or conflicts he faced.", 'right_answer': 'Albert Einstein was born in Ulm, Germany in 1879. His early education was marked by his rebellious nature and conflicts with authority figures. He showed a strong aptitude for mathematics and science from a young age, teaching himself calculus by the age of 12. Despite facing challenges in school, Einstein went on to study physics at the Zurich Polytechnic. He faced difficulties in finding employment after leaving school and eventually found work as a patent clerk. It was during his time as a patent clerk that he published his groundbreaking papers in 1905.'},

{'question_number': 3, 'question': "Explain Albert Einstein's family background and his upbringing.", 'right_answer': "Albert Einstein was born into a middle-class Jewish family in Germany. His father, Herman Einstein, worked as a salesman and engineer, while his mother, Pauline Koch, took care of the household. Einstein had two siblings, an elder sister named Maja and a younger brother named Hans Albert. The family moved to Munich when Einstein was one year old. Despite his

parents' hopes for him to pursue a career in business, Einstein showed a strong interest in science from a young age. His parents supported his education and he attended various schools in Germany and Switzerland."},

{'question_number': 4, 'question': "Discuss Albert Einstein's professional achievements and his impact on the field of physics.", 'right_answer': "Albert Einstein made numerous profound contributions to the field of physics. His theory of relativity revolutionized our understanding of space, time, and gravity. The equation $E=mc^2$, which represents the equivalence of mass and energy, is one of his most famous discoveries. Einstein's work on the photoelectric effect confirmed the particle-like nature of light and laid the foundation for the development of quantum mechanics. He also made significant contributions to the understanding of Brownian motion and the understanding of the existence of atoms and molecules. Einstein's theories continue to shape the field of physics and have had a lasting impact on our understanding of the universe."}, {'question_number': 5, 'question': "Describe Albert Einstein's educational background and his journey towards becoming a renowned physicist.", 'right_answer': "Albert Einstein's educational journey began in Munich, where he attended Catholic Elementary School and later enrolled in Luitpold Gymnasium. He showed a strong aptitude for mathematics and physics from a young age, and his independent study of calculus at the age of 12 set him on a path towards a career in science. Einstein's rebellious nature and conflicts with authority figures led to his expulsion from schools on multiple occasions. Despite not obtaining a degree, he gained admission to the Zurich Polytechnic and studied physics. After completing his studies, he faced difficulties in finding employment but eventually secured a position as a patent clerk. It was during his time as a patent clerk that he made groundbreaking discoveries and published his famous papers in 1905."}]}

9. 860 words

INPUT = Elon Musk life story begins in South Africa, where he was born. Later, he went on to become an American entrepreneur who co-founded PayPal and established SpaceX, a launch vehicle and spacecraft manufacturer. He was also one of the original major investors in and the CEO of Tesla, an electric car company. Elon Reeve Musk is the eldest of his parents' three children, and a citizen of three countries: South Africa, Canada, and the United States. He was born in 1971 to Maye Musk, a model and nutritionist, and Errol Musk, an

electromechanical engineer whom Elon has described as "a dreadful human being." Read the entire article to learn about Elon Musk History which is inspiring for generations to come. Musk was born in Canada to a Canadian mother and a South African father. Musk grew up with his head stuck in books and computers. He was bullied by his classmates and often beaten up by class bullies as a little, timid youngster until he grew strong enough to defend himself during a growth spurt in his teens. He developed a video game at the age of 12 and sold it to a computer magazine. Musk left South Africa in 1988 after getting a Canadian passport because he refused to support apartheid through compulsory military duty and wanted to pursue the higher economic prospects offered in the United States. Musk travelled to Canada at the age of 17 to attend Queen's University and evade military service in South Africa. Musk got his Canadian citizenship the same year, partly because he thought it would be easier to get American citizenship that way. Musk moved to the United States in 1992 to study business and physics at the University of Pennsylvania. He earned an undergraduate degree in economics before continuing on to earn a second bachelor's degree in physics. Musk went to Stanford University in California to earn a Ph.D. in energy physics after leaving Penn. But that Ph.D couldn't make it to Elon Musk Degrees since he walked out of Stanford after only two days to start his first firm. In the summer of 1995, Musk relocated to Silicon Valley. He enrolled at Stanford University's PhD programme in applied physics, but dropped out after only two days. Kimball Musk, Elon's 15-month younger brother, had recently graduated from Queen's University with a business degree and had travelled to California to join him. As the early Internet grew in popularity, the brothers decided to develop a company called Zip2, an internet business directory with maps. That's how Elon Musk started entering into the business world. Zip2 eventually recruited angel investors and grew into a profitable firm thanks to the brothers' efforts. Zip2 was sold to Compaq for \$ 307 million in 1999 by the brothers. Elon subsequently went on to create his own online financial services company, X.com. Confinity, a company formed by Peter Thiel and two others mere months after X.com and with headquarters in the same building, was its main competitor. In March 2000, the two firms joined and adopted the name of their major product, PayPal, an online money transfer service for individuals. In October 2002, Ebay, the online auction site, purchased PayPal for \$ 1.5 billion in Ebay stock. Elon Musk, who had been the largest shareholder in PayPal with 11.7% of the company's equity shares, found himself with \$ 165 million in Ebay stock at the age of 31. Since leaving PayPal, he has founded, co-founded, and/or led companies focused on addressing three distinct existential

risks to humanity's long-term survival: climate risk, single-planet dependency risk, and human species obsolescence risk. Two of these companies, SpaceX and Tesla Motors, he risked his entire early fortune to build. Musk joined engineers Martin Eberhard and Marc Tarpenning to help operate Tesla Motors in 2004, where he played a key role in the development of the world's first electric vehicle, the Tesla Roadster. Musk took over as CEO and product architect after Eberhard was fired from the company in 2007 due to a series of conflicts. Tesla has grown to be one of the most popular and desirable vehicle brands in the world under his leadership. Elon Musk's SpaceX has signed many high-profile contracts with NASA and the US Air Force to manufacture rockets and execute military missions. Musk has been vocal about his desire to work with NASA on a collaborative mission to deploy an astronaut to Mars by 2025. Elon Musk has always been a proponent of various space-age technologies, but it hasn't always been a smooth journey for him. He went on to become a small business owner and eventually the CEO of two creative firms after being bullied in school. But he made the decision to ascend from there and never settle for anything less. Tesla, in addition to creating electric automobiles, has a strong presence in the solar energy sector, courtesy to its purchase of SolarCity. This clean-energy services company, which was founded in 2006, now develops two rechargeable solar batteries that are primarily used for stationary energy storage. The Powerwall is designed for residential backup power and off-grid use, whereas the Powerpack is designed for business or electric utility grid use."""

OUTPUT =

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{'question_number': 2, 'question': 'Which company did Elon Musk co-found?', 'option1': 'PayPal', 'option2': 'SpaceX', 'option3': 'Tesla', 'option4': 'All of the above', 'right_answer': 'All of the above'},
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{'question_number': 3, 'question': 'Where did Elon Musk study business and physics?', 'option1': 'Stanford University', 'option2': 'University of Pennsylvania',
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'option3': "Queen's University", 'option4': 'None of the above', 'right_answer': 'University of Pennsylvania'},

{'question_number': 4, 'question': 'Which company did Elon Musk sell to Compaq?', 'option1': 'Zip2', 'option2': 'X.com', 'option3': 'PayPal', 'option4': 'None of the above', 'right_answer': 'Zip2'},

{'question_number': 5, 'question': 'Which two companies did Elon Musk risk his early fortune to build?', 'option1': 'SpaceX and Tesla Motors', 'option2': 'Tesla Motors and PayPal', 'option3': 'PayPal and SpaceX', 'option4': 'None of the above', 'right_answer': 'SpaceX and Tesla Motors'}],

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{'question_number': 2, 'question': 'At what age did Elon Musk develop a video game?', 'right_answer': '12'},

{'question_number': 3, 'question': 'Why did Elon Musk leave South Africa?', 'right_answer': 'To pursue higher economic prospects in the United States'},

{'question_number': 4, 'question': 'At what age did Elon Musk travel to Canada?', 'right_answer': '17'},

{'question_number': 5, 'question': 'For what purpose is the Powerpack designed?', 'right_answer': 'Business or electric utility grid use'}],

'fill_in_the_blank_type_questions': [

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{'question_number': 2, 'question': 'Elon Musk developed a video game at the age of _____.', 'right_answer': '12'},

{'question_number': 3, 'question': 'Elon Musk left South Africa in _____ after getting a Canadian passport.', 'right_answer': '1988'},

{'question_number': 4, 'question': 'Elon Musk attended _____ to study business and physics.', 'right_answer': 'University of Pennsylvania'},

{'question_number': 5, 'question': 'Zip2 was sold to _____ for \$ 307 million in 1999.', 'right_answer': 'Compaq'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': "Describe Elon Musk's early life and education.", 'right_answer': "Elon Musk was born in South Africa and later moved to Canada and the United States. He attended Queen's University in Canada and then studied business and physics at the University of Pennsylvania. He also briefly attended Stanford University. Musk's childhood was challenging as he was bullied in school and faced family issues."},

{'question_number': 2, 'question': "Explain the significance of Zip2 and PayPal in Elon Musk's career.", 'right_answer': "Zip2, co-founded by Elon Musk, was an internet business directory that became profitable and was later sold to Compaq. This success allowed Musk to start his own online financial services company, X.com, which eventually merged with Confinity to form PayPal. The sale of PayPal to eBay provided Musk with a significant financial boost."},

{'question_number': 3, 'question': "Discuss Elon Musk's involvement in SpaceX and Tesla Motors.", 'right_answer': "Elon Musk played a key role in the development of Tesla Motors, starting with the Tesla Roadster, the world's first electric vehicle. He later became CEO and product architect of Tesla. Musk also founded SpaceX, a company focused on manufacturing rockets and executing space missions. Both SpaceX and Tesla have been successful under Musk's leadership."},

{'question_number': 4, 'question': "What are some of the areas of focus for Elon Musk's companies?", 'right_answer': "Elon Musk's companies, such as SpaceX and Tesla, are focused on addressing existential risks to humanity's long-term survival. This includes climate risk, single-planet dependency risk, and human species

obsolescence risk. Tesla has also expanded its presence in the solar energy sector through the acquisition of SolarCity."},

```
{'question_number': 5, 'question': "Explain Elon Musk's vision for Mars exploration.", 'right_answer': "Elon Musk has expressed a desire to work with NASA on a collaborative mission to deploy an astronaut to Mars by 2025. He believes in the importance of space exploration and colonization as a way to ensure the long-term survival of humanity. Musk's company SpaceX has signed contracts with NASA and the US Air Force for manufacturing rockets and executing missions."}}
```

2. CHEMISTRY (10 tests)

10. 211 words

INPUT = J.J.Thomson carried out experiments by taking gases at low pressure of 0.01mm Hg in a discharge tube. A discharge tube is a long glass tube having two metal plates connected to the oppositely charged poles of a battery. These metal plates are called cathode and anode. Application of high voltage results in ionisation of gas by ejection of negatively charged particles which were named as electrons. These particles originate from cathode rays. The presence of positively charged particles in an atom had been predicted by Goldstein based on the electrical neutrality of an atom. The discovery of protons by Goldstein was based on the electrical neutrality of an atom. The discovery of protons by Goldstein was done on the basis of the cathode ray experiment. The resultant positively charged ions after the ejection of electrons were found to emanate from the anode. These are called anode rays or canal rays. Anode rays or canal rays are a stream of positively charged particles. When hydrogen gas is taken in a discharge tube, the anode rays were found to be nothing but protons. The discovery of electrons and protons as subatomic particles inside the atom leads to the conception of atomic models which depict the arrangement of the fundamental particles in an atom. ""

OUTPUT =

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```
{'question_number': 2, 'question': 'What is a discharge tube?', 'option1': 'A glass tube connected to a battery', 'option2': 'A long metal rod', 'option3': 'A type of bell jar', 'option4': 'A container for gases', 'right_answer': 'A glass tube connected to a battery'},
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{'question_number': 3, 'question': 'What did J.J. Thomson discover in his experiments?', 'option1': 'Neutrons', 'option2': 'Protons', 'option3': 'Electrons', 'option4': 'Alpha particles', 'right_answer': 'Electrons'},
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{'question_number': 4, 'question': 'Who predicted the presence of positively charged particles in an atom?', 'option1': 'Goldstein', 'option2': 'J.J. Thomson', 'option3': 'Einstein', 'option4': 'Rutherford', 'right_answer': 'Goldstein'},

{'question_number': 5, 'question': 'What are anode rays also known as?', 'option1': 'Cathode rays', 'option2': 'Protons', 'option3': 'Canal rays', 'option4': 'Alpha particles', 'right_answer': 'Canal rays'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What are the metal plates connected to the poles of a battery called?', 'right_answer': 'cathode and anode'},

{'question_number': 2, 'question': 'What are the positively charged ions called after the ejection of electrons?', 'right_answer': 'anode rays or canal rays'},

{'question_number': 3, 'question': 'What are the fundamental particles in an atom called?', 'right_answer': 'electrons and protons'},

{'question_number': 4, 'question': 'What is the arrangement of the fundamental particles in an atom called?', 'right_answer': 'atomic models'},

{'question_number': 5, 'question': 'What were the anode rays found to be when hydrogen gas was used?', 'right_answer': 'protons'}],

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{'question_number': 1, 'question': 'A discharge tube is a long glass tube having two metal plates connected to the oppositely charged poles of a _____.', 'right_answer': 'battery'},

{'question_number': 2, 'question': 'J.J. Thomson discovered _____ as subatomic particles inside the atom.', 'right_answer': 'electrons and protons'},

{'question_number': 3, 'question': 'Goldstein predicted the presence of _____ in an atom.', 'right_answer': 'positively charged particles'},

{'question_number': 4, 'question': 'The positively charged ions after the ejection of electrons are called _____ or canal rays.', 'right_answer': 'anode rays'},

{'question_number': 5, 'question': 'Anode rays were found to be nothing but _____ when hydrogen gas was used.', 'right_answer': 'protons'}],

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{'question_number': 1, 'question': 'Describe the process of ionisation of gas in a discharge tube.', 'right_answer': 'When a high voltage is applied to a gas at low pressure in a discharge tube, it results in the ejection of negatively charged particles called electrons, which originate from cathode rays.'},

{'question_number': 2, 'question': 'Explain the discovery of protons by Goldstein.', 'right_answer': 'Goldstein discovered protons based on the electrical neutrality of an atom. He observed positively charged ions emanating from the anode in a discharge tube, which were later identified as protons.'},

{'question_number': 3, 'question': 'What do atomic models depict? Explain with examples.', 'right_answer': 'Atomic models depict the arrangement of the fundamental particles (electrons and protons) in an atom. Examples of atomic models include the plum pudding model, the planetary model, and the modern quantum mechanical model.'},

{'question_number': 4, 'question': 'Discuss the significance of the discovery of electrons and protons as subatomic particles.', 'right_answer': 'The discovery of electrons and protons revolutionized our understanding of the atom. It provided evidence for the existence of subatomic particles and led to the development of atomic models, which are fundamental to our understanding of chemistry and physics.'},

{'question_number': 5, 'question': 'What are anode rays? Explain their connection to protons.', 'right_answer': 'Anode rays, also known as canal rays, are a stream of positively charged particles. When hydrogen gas is used in a discharge tube, the anode rays were found to be protons. This discovery provided further evidence for the existence of protons as subatomic particles inside the atom.'}]]

11. 269 words

INPUT = Hydrogen is the first element in the periodic table and has the atomic number one. Those elements which have the same atomic number but a different mass number are called isotopes. There are three isotopes of hydrogen namely, protium ${}^1\text{H}$, deuterium ${}^2\text{H}$ or D and lastly tritium ${}^3\text{H}$ or T. The isotopes are different because of the different number of neutrons present in them. In protium, there is no presence of neutrons, whereas in deuterium we have one neutron and in tritium, we have two neutrons. The most prominent form of hydrogen is protium, 0.0156% of hydrogen is present on the earth's surface as deuterium. In tritium, the concentration is one atom per 10^{18} atoms of protium. Out of these three isotopes of hydrogen, Out of these three isotopes of hydrogen, only tritium is radioactive in nature which emits low-energy beta particles. As the electronic configuration of isotopes is the same, they all have similar chemical properties. But they have a difference in their rates of reaction, this happens because of the different bond disassociation enthalpies. They have different physical properties because of the large variations in mass. The occurrence of hydrogen on earth is difficult due to its light nature. In combined it forms 15.4% of hydrogen that occurs in the earth's crust and oceans. Hydrogen also occurs in plant and animal tissues, hydrocarbons, proteins, hydrides, and many other compounds. In the universe, hydrogen is the most abundant element (70% of the total mass) and it is also the principal element of the solar atmosphere. Even the huge planets such as Jupiter and Saturn mainly consist of hydrogen."""

OUTPUT =

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{'question_number': 2, 'question': 'Which isotope of hydrogen does not contain any neutrons?', 'option1': 'Protium', 'option2': 'Deuterium', 'option3': 'Tritium', 'option4': 'None of the above', 'right_answer': 'Protium'},
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{'question_number': 3, 'question': 'Which isotope of hydrogen is radioactive in nature?', 'option1': 'Protium', 'option2': 'Deuterium', 'option3': 'Tritium', 'option4': 'None of the above', 'right_answer': 'Tritium'},

{'question_number': 4, 'question': 'What is the most abundant element in the universe?', 'option1': 'Hydrogen', 'option2': 'Protium', 'option3': 'Deuterium', 'option4': 'Tritium', 'right_answer': 'Hydrogen'},

{'question_number': 5, 'question': 'Which isotopes of hydrogen have similar chemical properties?', 'option1': 'Protium and Deuterium', 'option2': 'Deuterium and Tritium', 'option3': 'Protium and Tritium', 'option4': 'All of the above', 'right_answer': 'All of the above'}],

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{'question_number': 2, 'question': '"What is the concentration of deuterium on Earth's surface?"', 'right_answer': '0.0156%'},

{'question_number': 3, 'question': 'How many neutrons are present in tritium?', 'right_answer': 'two'},

{'question_number': 4, 'question': 'What is the radioactive nature of tritium emitted by?', 'right_answer': 'low-energy beta particles'},

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{'question_number': 2, 'question': 'The isotopes of hydrogen have different number of _____ present in them.', 'right_answer': 'neutrons'},

{'question_number': 3, 'question': 'Hydrogen forms _____ of hydrogen that occurs in the earth's crust and oceans.', 'right_answer': '15.4%'},

{'question_number': 4, 'question': 'Hydrogen primarily consists of _____ in the universe.', 'right_answer': '70% of the total mass'},

{'question_number': 5, 'question': 'Huge planets such as Jupiter and Saturn mainly consist of _____.', 'right_answer': 'hydrogen'}}],

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{'question_number': 1, 'question': 'Explain the concept of isotopes of hydrogen and their differences.', 'right_answer': 'Isotopes of hydrogen are elements with the same atomic number but different mass numbers. There are three isotopes of hydrogen: protium, deuterium, and tritium. Protium has no neutrons, deuterium has one neutron, and tritium has two neutrons. Tritium is the only radioactive isotope of hydrogen. Despite having the same electronic configuration and similar chemical properties, the isotopes differ in their rates of reaction and physical properties due to variations in mass.'},

{'question_number': 2, 'question': 'Discuss the occurrence and abundance of hydrogen on Earth and in the universe.', 'right_answer': "Hydrogen is difficult to occur on Earth due to its light nature. It forms 15.4% of hydrogen that occurs in the earth's crust and oceans. Hydrogen is also found in plant and animal tissues, hydrocarbons, proteins, hydrides, and other compounds. In the universe, hydrogen is the most abundant element, accounting for 70% of the total mass. It is the principal element of the solar atmosphere and even forms the major component of huge planets like Jupiter and Saturn."},

{'question_number': 3, 'question': 'Explain the concept of bond disassociation enthalpies and its relevance to isotopes of hydrogen.', 'right_answer': 'Bond disassociation enthalpies refer to the energy required to break a specific bond. The isotopes of hydrogen have different bond disassociation enthalpies due to variations in mass. This results in differences in their rates of reaction. While isotopes have the same electronic configuration and similar chemical properties,

these differences in bond strength affect their reactivity. The physical properties of isotopes also differ due to the large variations in mass.'},

{'question_number': 4, 'question': 'Discuss the properties and characteristics of tritium as a radioactive isotope.', 'right_answer': 'Tritium is a radioactive isotope of hydrogen. It has two neutrons in its nucleus. Being radioactive, tritium emits low-energy beta particles. It is the least abundant isotope of hydrogen, with a concentration of one atom per 10^{18} atoms of protium. Tritium has similar chemical properties to other isotopes of hydrogen but differs in its radioactive nature. Due to its radioactivity, tritium is used in various applications such as nuclear reactors, nuclear weapons, and in certain types of lighting.'},

{'question_number': 5, 'question': 'Explain why the occurrence of hydrogen on Earth is difficult and its significance.', 'right_answer': "The occurrence of hydrogen on Earth is challenging due to its light nature. It is the lightest element and tends to escape Earth's gravitational pull easily. Despite this, hydrogen is found in various forms on Earth, including in the earth's crust, oceans, plant and animal tissues, hydrides, hydrocarbons, proteins, and other compounds. It also plays a crucial role in the universe, being the most abundant element. Hydrogen is the principal element of the solar atmosphere and is a major constituent of massive planets like Jupiter and Saturn."}}

12. 350 words

INPUT = There are five basic laws of chemical combination that govern the chemical combinations of elements. 1. Law of Conservation of Mass In simple terms, this law states that matter can neither be created nor destroyed. In other words, the total mass, that is, the sum of the mass of reacting mixture and the products formed remains constant. Antoine Lavoisier gave this law in the year 1789 based on the data he obtained after carefully studying numerous combustion reactions. 2. Law of Definite Proportions Joseph Proust, a French chemist stated that the proportion of elements by weight in a given compound will always remain exactly the same. In simple terms, we can say that irrespective of its source, origin or its quantity, the per cent composition of elements by weight in a given compound will always remain the same. 3. Law of Multiple Proportions This law states that if two elements combine to form more than one compound, the masses

of these elements in the reaction are in the ratio of small whole numbers. This law was given by Dalton in the year 1803. 4. Gay Lussac's Law of Gaseous Volumes In 1808, Gay Lussac gave this law based on his observations. This law states that when gases are produced or combine in a chemical reaction, they do so in a simple ratio by volume given that all the gases are at the same temperature and pressure. This law can be considered as another form of the law of definite proportions. The only difference between these two laws of chemical combination is that Gay Lussac's Law is stated with respect to volume while the law of definite proportions is stated with respect to mass. 5. Avogadro's Law Avogadro proposed this law in the year 1811. It stated that under the same conditions of temperature and pressure, an equal volume of all the gases contains an equal number of molecules. This implies that 2 litres of hydrogen will have the same number of molecules as 2 litres of oxygen given that both the gases are at the same temperature and pressure."""

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{'question_number': 3, 'question': 'According to the Law of Multiple Proportions, the masses of elements in a compound are in the ratio of:', 'option1': 'Prime numbers', 'option2': 'Odd numbers', 'option3': 'Large whole numbers', 'option4': 'Small whole numbers', 'right_answer': 'Small whole numbers'},
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```

Lussac's Law of Gaseous Volumes', 'right_answer': 'Gay Lussac's Law of Gaseous Volumes'}},

{ 'question_number': 5, 'question': 'Avogadro's Law states that equal volumes of all gases contain an equal number of:', 'option1': 'Atoms', 'option2': 'Molecules', 'option3': 'Ions', 'option4': 'Protons', 'right_answer': 'Molecules' }],

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{ 'question_number': 2, 'question': 'Who gave the Law of Definite Proportions?', 'right_answer': 'Joseph Proust' },

{ 'question_number': 3, 'question': 'According to the Law of Multiple Proportions, the masses of elements in a compound are in the ratio of _____ whole numbers.', 'right_answer': 'small' },

{ 'question_number': 4, 'question': 'Which law states that gases combine in a simple ratio by _____?', 'right_answer': 'volume' },

{ 'question_number': 5, 'question': 'Avogadro's Law states that equal volumes of all gases contain an equal number of _____.', 'right_answer': 'molecules' }],

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{ 'question_number': 2, 'question': 'According to the Law of Definite Proportions, the proportion of elements by weight in a compound will always remain _____ the same.', 'right_answer': 'exactly' },

{'question_number': 3, 'question': 'If two elements combine to form more than one compound, the masses of these elements in the reaction are in the ratio of _____ whole numbers.', 'right_answer': 'small'},

{'question_number': 4, 'question': 'Gay Lussac's Law of Gaseous Volumes is stated with respect to _____, while the law of definite proportions is stated with respect to _____.', 'right_answer': 'volume, mass'},

{'question_number': 5, 'question': 'Under the same conditions of temperature and pressure, an equal volume of all the gases contains an equal number of _____.', 'right_answer': 'molecules'}],

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{'question_number': 1, 'question': 'Explain the Law of Conservation of Mass and who proposed it.', 'right_answer': 'The Law of Conservation of Mass states that matter can neither be created nor destroyed. It was proposed by Antoine Lavoisier in the year 1789 based on the data he obtained from combustion reactions.'},

{'question_number': 2, 'question': 'Describe the Law of Definite Proportions and its significance.', 'right_answer': '"The Law of Definite Proportions states that the proportion of elements by weight in a given compound will always remain exactly the same. This means that regardless of the compound's source or quantity, its per cent composition of elements by weight will always be constant. This law was proposed by Joseph Proust and it is significant in understanding the consistent composition of compounds.'"},

{'question_number': 3, 'question': 'What is the Law of Multiple Proportions and who proposed it?', 'right_answer': 'The Law of Multiple Proportions states that if two elements combine to form more than one compound, the masses of these elements in the reaction are in the ratio of small whole numbers. John Dalton proposed this law in 1803, and it helps explain the different combinations of elements in compounds.'},

{'question_number': 4, 'question': 'Explain Gay Lussac's Law of Gaseous Volumes and its relationship to the Law of Definite Proportions.', 'right_answer': 'Gay Lussac's Law of Gaseous Volumes states that when gases are produced or combine

in a chemical reaction, they do so in a simple ratio by volume, assuming all gases are at the same temperature and pressure. This law is similar to the Law of Definite Proportions, which is stated with respect to mass. The difference is that Gay Lussac's Law focuses on volume ratios while the Law of Definite Proportions focuses on mass ratios.'},

{'question_number': 5, 'question': 'Discuss Avogadro's Law and its implications for equal volumes of gases.', 'right_answer': 'Avogadro's Law, proposed by Avogadro in 1811, states that under the same conditions of temperature and pressure, equal volumes of all gases contain an equal number of molecules. This means that regardless of the gas, 2 litres of hydrogen will have the same number of molecules as 2 litres of oxygen, as long as both are at the same temperature and pressure. This law is important in understanding the relationship between volume and number of molecules in gases.'}]}

13. 1083 words

INPUT = The Pauli Exclusion Principle is one of the important principles, along with the Aufbau Principle and Hund's Rule in Chemistry. Learning about it is crucial for students, especially when they are studying about electrons. The Pauli exclusion principle basically helps us to understand the electron arrangements in atoms and molecules, and it also gives an explanation for the classification of elements in the periodic table. In this section, we will study the Pauli exclusion principle in detail and learn about all the underlying concepts. What Is the Pauli Exclusion Principle? The Pauli exclusion principle states that in a single atom, no two electrons will have an identical set or the same quantum numbers (n , l , m_l , and m_s). To put it in simple terms, every electron should have or be in its own unique state (singlet state). There are two salient rules that the Pauli exclusion principle follows: Only two electrons can occupy the same orbital. The two electrons that are present in the same orbital must have opposite spins, or they should be antiparallel. However, the Pauli exclusion principle does not only apply to electrons, it applies to other particles of half-integer spin, such as fermions. It is not relevant for particles with an integer spin, such as bosons which have symmetric wave functions. Moreover, bosons can share or have the same quantum states, unlike fermions. As far as the nomenclature goes, fermions are named after the Fermi-Dirac statistical distribution that they follow. Bosons, on the other hand, get their name from the Bose-Einstein distribution function. Formulation of the Principle An Austrian physicist named Wolfgang Pauli formulated the principle in

the year 1925. With this principle, he basically described the behaviour of the electrons. Later in the year 1940, he expanded on the principle to cover all fermions under his spin-statistics theorem. Besides, fermions that are described by the principle include elementary particles such as quarks, electrons, neutrinos, and baryons. Wolfgang Pauli was awarded the Nobel Prize in the year 1945 for the discovery of the Pauli exclusion principle and his overall contribution to the field of quantum mechanics. He was nominated by Albert Einstein for the award.

Pauli Exclusion Principle in Chemistry In Chemistry, the law is mainly used to explain or determine the electron shell structure of atoms and predict which atoms are likely to donate electrons. How does the principle work, or where does it apply? Well, if we look at the atoms, whenever it gains a new electron or electrons, it usually moves to the lowest energy state or shifts to the outermost shell. If the state has one electron, then it can either spin up or spin down. Now, if we consider the Pauli exclusion principle, if there are two electrons in a state, then each of the electrons will have a spinup or spin downstate but not the same.

Pauli Exclusion Principle Example We can take a neutral helium atom as a common Pauli exclusion principle example. The atom has 2 bound electrons, and they occupy the outermost shell with opposite spins. Here, we will find that the two electrons are in the 1s subshell where $n = 1$, $l = 0$, and $m_l = 0$. Their spin moments will also be different. One will be $m_s = -1/2$, and the other will be $+1/2$. If we draw a diagram, then the subshell of the helium atom will be represented with 1 “up” electron and 1 “down” electron. In essence, 1s subshell consists of two electrons, which have opposite spins. Similarly, if we take hydrogen, it will have 1s subshell with 1 “up” electron (1s¹). Lithium will have the helium core (1s²) and then one more “up” electron (2s¹). What we are trying to depict here is that the electron configuration of the orbitals is written in the following manner.

Pauli Exclusion Principle From the above example, we can further deduce that successive larger elements will have shells of successively higher energy. The number of electrons in the outermost shell is also directly related to the different chemical properties that elements possess. Elements with the same number of electrons in the outermost shell will have similar properties.

Nuclear Stability and Pauli Exclusion Principle The nuclei in an atom consist of neutrons and protons, which are held together by the nuclear force. However, protons tend to repel each other via electromagnetic force as a result of their positive charge. Basically, these two forces are working against (competing) each other, thereby leading to the stability of nuclei. Meanwhile, you will find only certain sets or combinations of protons and neutrons that form stable nuclei. The nucleus is mostly stabilised by the neutrons

as they attract each other and protons. This further helps counterbalance the electrical repulsion between protons. When this happens, the number of protons goes up. In essence, an increasing ratio of neutrons to protons is needed to form a stable nucleus. In case there are a larger number of (neutrons also obey the Pauli exclusion principle) or too few neutrons for a given number of protons, the nucleus of the atom is not stable. This will lead to radioactive decay. In addition, Pauli exclusion principle also has an effect on the critical energy of fissile and fissionable nuclei. For example, if we look at actinides that have an odd neutron number, they are usually fissile or, in other words, fissionable with slow neutrons. On the other hand, actinides that have even neutron numbers are usually not fissile, or we can say that they are fissionable with fast neutrons. Similarly, due to the Pauli exclusion principle, heavy nuclei with an even number of protons and neutrons are very stable due to the presence of 'paired spin'. Alternatively, nuclei with an odd number are unstable.

Importance and Applications of Pauli Exclusion Principle

The Pauli exclusion principle helps to explain a wide variety of physical phenomena, such as the electron shell structure of atoms and the way atoms share electrons. It helps in describing the various chemical elements and how they participate in forming chemical bonds. The periodic table can also be defined with the help of this principle.

Solid-state properties: Many electrical, optical, magnetic, mechanical and chemical properties of solids are the direct consequence of Pauli exclusion. The principle helps in describing the stability of large systems with many electrons and many nucleons. Apart from Chemistry, the principle is a fundamental principle in quantum mechanics which is mainly studied in Physics. It is also used in astrophysics. ""

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'option3': 'A principle that states electrons must have the same quantum numbers.',
'option4': 'A principle that states electrons can share the same quantum states.',
'right_answer': 'A principle that states no two electrons will have an identical set of quantum numbers.'},
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{'question_number': 3, 'question': 'Who formulated the Pauli Exclusion Principle?', 'option1': 'Albert Einstein', 'option2': 'Wolfgang Pauli', 'option3': 'Neil Bohr', 'option4': 'Marie Curie', 'right_answer': 'Wolfgang Pauli'},

{'question_number': 4, 'question': 'Which type of particles have symmetric wave functions?', 'option1': 'Fermions', 'option2': 'Bosons', 'option3': 'Protons', 'option4': 'Neutrons', 'right_answer': 'Bosons'},

{'question_number': 5, 'question': 'What was Wolfgang Pauli awarded the Nobel Prize for?', 'option1': 'His contributions to atomic structure', 'option2': 'His discovery of the Pauli Exclusion Principle', 'option3': 'His formulation of the Aufbau Principle', 'option4': 'His development of Hund's Rule', 'right_answer': 'His discovery of the Pauli Exclusion Principle'}],

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{'question_number': 2, 'question': 'Who formulated the Pauli Exclusion Principle?', 'right_answer': 'Wolfgang Pauli'},

{'question_number': 3, 'question': 'What type of particles does the Pauli Exclusion Principle apply to?', 'right_answer': 'Fermions'},

{'question_number': 4, 'question': 'What is the name given to particles with symmetric wave functions?', 'right_answer': 'Bosons'},

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{'question_number': 2, 'question': 'Fermions are particles of ____ spin.', 'right_answer': 'half-integer'},

{'question_number': 3, 'question': 'Wolfgang Pauli was awarded the Nobel Prize in ____ for the discovery of the Pauli exclusion principle.', 'right_answer': '1945'},

{'question_number': 4, 'question': 'The Pauli exclusion principle does not apply to particles of ____ spin.', 'right_answer': 'integer'},

{'question_number': 5, 'question': 'Bosons can share ____ quantum states.', 'right_answer': 'the same'}],

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{'question_number': 1, 'question': 'Explain the Pauli Exclusion Principle in your own words.', 'right_answer': 'The Pauli Exclusion Principle states that no two electrons in a single atom can have the same set of quantum numbers. This means that each electron must have its own unique state. Additionally, if two electrons occupy the same orbital, they must have opposite spins. This principle applies to particles of half-integer spin, known as fermions, but not to particles of integer spin, known as bosons.'},

{'question_number': 2, 'question': 'Describe the formulation of the Pauli Exclusion Principle by Wolfgang Pauli.', 'right_answer': '"Wolfgang Pauli formulated the Pauli Exclusion Principle in 1925 to describe the behavior of electrons in atoms. He later expanded on the principle to cover all fermions under his spin-statistics theorem. This principle applies not only to electrons, but also to other fermions such as quarks, neutrinos, and baryons. Pauli's formulation of the Pauli Exclusion Principle earned him the Nobel Prize in 1945.'"},

{'question_number': 3, 'question': 'How is the Pauli Exclusion Principle applied in Chemistry?', 'right_answer': 'In Chemistry, the Pauli Exclusion Principle is used to explain the electron shell structure of atoms and predict which atoms are likely to donate electrons. It states that when an atom gains a new electron, it will move to the lowest energy state or outermost shell. If there are already two electrons in a state, each electron will have a different spin. This principle helps determine the electron configurations of atoms, which in turn affects their chemical properties.'}, {'question_number': 4, 'question': 'What is the significance of the Pauli Exclusion Principle in nuclear stability?', 'right_answer': 'The Pauli Exclusion Principle has a significant impact on nuclear stability. It explains that the stability of nuclei is maintained through a balance between the nuclear force that holds neutrons and protons together and the electromagnetic force which causes protons to repel each other. If there are too few or too many neutrons for a given number of protons, the nucleus becomes unstable and undergoes radioactive decay. The principle also affects the critical energy of fissile and fissionable nuclei, determining whether they can undergo fission with slow or fast neutrons.'},

{'question_number': 5, 'question': 'Discuss some of the importance and applications of the Pauli Exclusion Principle.', 'right_answer': 'The Pauli Exclusion Principle plays a crucial role in explaining various physical phenomena. It helps explain the electron shell structure of atoms, the formation of chemical bonds, and the properties of different elements. It also contributes to the understanding of solid-state properties such as electrical, optical, magnetic, mechanical, and chemical properties. The principle is fundamental in quantum mechanics and finds applications in fields like astrophysics. Overall, the Pauli Exclusion Principle has broad implications in various branches of science.'}}}

14. 1100 words

INPUT = The melting point is usually defined as the point at which materials changes from a solid to a liquid. The temperature at which solid changes its state to liquid at atmospheric pressure is called the melting point of that liquid. This is the point at which both liquid and solid phase exists at equilibrium. The melting point of the substance also varies with pressure and is specified at standard pressure. The term ‘freezing point’ is used to denote the temperature at which a liquid is converted into a solid and can, therefore, be viewed as the opposite of the term ‘melting point’. However, substances can be cooled below their freezing

points without the formation of a solid. Such liquids are known as supercooled liquids. What is Boiling Point? The boiling point of a liquid is the temperature at which the vapour pressure of the liquid becomes equal to the atmospheric pressure of the liquid's environment. At this temperature, the liquid is converted into a vapour. The boiling point of the liquid depends upon the pressure of the surrounding. When the liquid is at high pressure, it has a higher boiling point than the boiling point at normal atmospheric pressure. The boiling point of different liquids is different for a given pressure. In 1982, IUPAC defined the standard boiling point of a liquid as the temperature at which the liquid boils under a pressure of 1 bar.

Boiling Point Definition The temperature at which liquid vapour pressure equals atmospheric pressure is referred to as boiling point. The boiling point is defined as the temperature at which a liquid's saturated vapour pressure equals the atmospheric pressure surrounding it. The boiling point for any material is the temperature point at which the material transforms into the gas phase in the liquid phase. This happens at 100 degrees centigrade for water. The Celsius scale was in fact created on the basis of the ice/water melting point and the liquid water/vapor boiling point. Each substance carries its own boiling point. The boiling point of a substance is dependent on the pressure of its surroundings. In mountainous terrains (where the altitude is high), the pressure of the atmosphere is relatively lower than the atmospheric pressure at sea level. This is the reason why food cooks at a slower pace in mountainous areas (the lower atmospheric pressure causes water to boil at temperatures below 100°C). When all the particles in the liquid phase have been transformed into the gas phase, the temperature begins to rise again, as long as heat is still being applied to the surrounding system. As the temperature starts to increase, so does the particle's kinetic energy.

Boiling Point of Water Water can boil, raise temperature or decrease air pressure, in two ways. At sea level, it is the pressure of air that causes water to boil at 100°C. Water can boil at a much lower temperature in vacuum, where there's no air. That is, if not for the skin that keeps the blood pressurized, body temperature would be sufficient to cause the blood to boil with water. At low air pressure the water boils significantly below 100°C at temperatures. The boiling point of water is the temperature at which the liquid water vapor pressure is equal to the pressure surrounding the body, and the body transforms into a vapour. The boiling point is the temperature for a particular liquid to boil at. For example, the boiling point for water, at a pressure of 1 atm, is 100 degrees Celsius. A liquid's boiling point depends upon the liquid's temperature, atmospheric pressure, and vapor pressure.

Melting Point Determination Principle Melting point may be defined in various

ways, each corresponding to a different residual amount of solid fat. The capillary tube melting point, also known as the complete melting point or clear point, is the temperature at which fat heated at a given rate becomes completely clear and liquid in a one end closed capillary. The slip melting point is performed similarly to the capillary tube method and measures the temperature at which a column of fat moves in an open capillary when heated. The dropping melting point or dropping point is the temperature at which the sample flows through a 0.11-in hole in a sample up placed in a specialized furnace. The Wiley melting point measures the temperature at which a 1/8 x 3/8 in disc of fat suspended in an alcohol water mixture of similar density changes into a sphere.

Melting Point Determination The melting point is determined in a capillary tube. The temperature at which the substance is completely melted as indicated by the disappearance of the solid, will be in the range of + or – 4oC from the stated value, unless otherwise indicated.

Details of the Procedure The following technique is adequate for the determination of melting point. Grind about 50mg of the substance to be tested in a small motor. Place the ground substance in a vacuum desiccator over silica gel or phosphorus pentoxide at room temperature and dry for about 24 hours. Place the substance in a dry capillary tube of 1mm internal diameter forming a column about 3mm high. Heat the melting point apparatus to a temperature of 5-10oC below the expected temperature of melting and adjust the heating so that the temperature in the chamber rises about 1oC per minute. Introduce the capillary with the substance into the heated chamber and note the temperature when the sintered substance becomes completely transparent, this is considered to be the melting point. The melting point denotes the temperature at which the substance has just completely melted; this is indicated by the disappearance of the solid phase and complete transparency of the melt.

Mixed Melting Points In the majority of cases, the presence of a foreign substance will lower the melting point of a pure organic compound. This fact is utilised in the so-called mixed melting point test for the identification of organic compounds. Consider an organic compound X having a melting point of 140oC is suspected to be o-chlorobenzoic acid. Its identity may be established by performing a melting point determination of a mixture containing approximately equal weights of X and of an authentic specimen of o-chlorobenzoic acid (A). If the melting point of the mixture is 140oC then X is o-chlorobenzoic acid, but if the melting point is depressed by several degrees A and X cannot be identical. It is recommended that at least three mixtures containing say 20 percent X +80 percent A:50 percent X+50

percent A; and 80 percent X+20 percent A be prepared and the melting point be determined."""

OUTPUT =

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{'question_number': 2, 'question': 'Which of the following factors does not affect the melting point of a substance?', 'option1': 'Pressure', 'option2': 'Atmospheric conditions', 'option3': 'Altitude', 'option4': 'Chemical composition', 'right_answer': 'Chemical composition'},

{'question_number': 3, 'question': 'What is the boiling point of a liquid dependent on?', 'option1': 'Temperature', 'option2': 'Pressure', 'option3': 'Altitude', 'option4': 'Chemical composition', 'right_answer': 'Pressure'}],

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'question': 'The boiling point of water is the temperature at which the liquid water vapor pressure is equal to the pressure surrounding the ____.', 'right_answer': 'body'}},

{'question_number': 3, 'question': 'The melting point is determined in a capillary tube. The temperature at which the substance is completely melted as indicated by the disappearance of the solid, will be in the range of + or – 4oC from the stated value, unless otherwise ____.', 'right_answer': 'indicated'}}],

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{'question_number': 1, 'question': 'Describe the difference between the melting point and the boiling point of a substance.', 'right_answer': 'The melting point is the temperature at which a substance changes from a solid to a liquid, while the boiling point is the temperature at which a substance changes from a liquid to a gas. The melting point is typically lower than the boiling point.'},

{'question_number': 2, 'question': 'Explain how the boiling point of a liquid is affected by pressure.', 'right_answer': 'The boiling point of a liquid is dependent on the pressure of its surroundings. At higher pressures, the boiling point is higher, and at lower pressures, the boiling point is lower. This is why water boils at a lower temperature in mountainous areas where the atmospheric pressure is lower.'},

{'question_number': 3, 'question': 'Discuss the concept of mixed melting points and how it can be used for the identification of organic compounds.', 'right_answer': 'Mixed melting points can be used to identify organic compounds by comparing the melting point of a mixture containing the compound in question with the melting point of a known sample. If the melting points match, it indicates that the compound in question is the same as the known sample. If the melting point is significantly different, it suggests that the compound in question is not identical to the known sample.'}}]

15. 770 words

INPUT = What is Thermodynamics? The branch which deals with the movement of energy from one form to the other and the relation between heat and temperature with energy and work done is called as thermodynamics. In other

terms we can define thermodynamics as the science stream that deals with the study of the combined effects of heat and work on the changes of state of matter confined by the laws of thermodynamics. Chemical reactions which releases heat energy associated with it are converted into different usable forms based on the laws of thermodynamics. The fact that energy can only be transformed from one form to the other forms and its use in different industries is on the basis of energy transformation. We are aware that chemical reactions have energy associated with it. The laws of thermodynamics deal with energy changes during a reaction and are not concerned with the rate at which the reaction is proceeding.

Define Chemical Thermodynamics Chemical thermodynamics is the study of relation between work, heat and chemical reactions or with the physical changes of the state which are confined to the laws of thermodynamics. Some general terms like heat, energy, and work were done are often used in thermodynamics. Let us learn a bit about basic thermodynamics and understand these terms.

Internal Energy It referred to the energy content within the system. The energy represents the overall energy of the system and may include many forms of energy such as potential energy, kinetic energy etc. In a chemical reaction, we know about the energy transformations and basic thermodynamics provides us with the information regarding energy change associated with the particles of the system.

Factors Affecting the Internal Energy The internal energy of a system may change when:
 Heat passes into or out of the system,
 Work is done on or by the system or
 matter enters or leaves the system.

Also Check \Rightarrow Internal energy Work Work done by a system is defined as the quantity of energy exchanged between a system and its surroundings. Work is completely governed by external factors such as an external force, pressure or volume or change in temperature etc.

Heat Heat in thermodynamics is defined as the kinetic energy of the molecules of the substance. Heat and the thermodynamics together form the basics which helped process designers and engineers to optimize their processes and harness the energy associated with chemical reactions economically. Heat energy flows from higher temperature to lower temperature.

Thermodynamic System and the Surrounding Thermodynamics defines a system as the part of the universe under study that is the part where observations are made. The surrounding and universe interact with each other and depending on the type of the system, exchange of matter and energies occur. The system's classification entirely depends on the movement of energy and matter in or out of the system. There are two types of system:

Open System: Those systems where the exchange of energy, as well as matter takes place, are treated as an open system. For example, water is boiled on a stove

without it being covered, the container behaves as an open system because it receives heat energy from an external source and the matter being released are water vapours.

Closed System: A closed system is referred to the system where only energy can be exchanged with the surrounding and not the matter. It can also be said that a closed system has a constant amount of matter and only the energy of the system can be changed. For instance, when we keep a shield bottle of water in the fridge, the loss of energy to the surrounding will result in the temperature of the water inside it going down even though the quantity of water in the bottle remains the same.

Isolated System: In case of isolated systems, neither energy nor matter can be exchanged between the system and the surrounding. An example of an isolated system is a Thermos flask. Let us see the major aspects on which environment can affect the thermodynamics of a system. There are four laws which govern the thermodynamic systems' phenomena, they are: **Laws of Thermodynamics** **First law of thermodynamics:** When energy moves into or out of a system, the system's internal energy changes in accordance with the law of conservation of mass. **Second law of thermodynamics:** The state of the entropy of the entire universe, as an isolated system, will always increase over time. **Third law of thermodynamics:** Entropy of a perfect crystal at absolute zero is zero. The laws of thermodynamics were the most important lesson for people understanding the mechanism behind phase change of matter."""

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work'}},
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'Energy created through waves or particles', 'option4': 'Type of energy that travels by waves or particles', 'right_answer': "Energy associated with object's motion"}],

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{'question_number': 1, 'question': 'What is another name for thermal energy?', 'right_answer': 'Heat'},

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{'question_number': 3, 'question': 'What does the flow of negatively charged electrons around a circuit result in?', 'right_answer': 'Electrical energy'}],

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{'question_number': 1, 'question': 'Potential energy is the energy stored in an object due to its _____.', 'right_answer': 'vertical position or height'},

{'question_number': 2, 'question': 'River water at the top of a waterfall is an example of _____.', 'right_answer': 'gravitational potential energy'},

{'question_number': 3, 'question': 'A car parked at the top of a hill has _____.', 'right_answer': 'gravitational potential energy'}],

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{'question_number': 1, 'question': 'Briefly explain the concept of energy.', 'right_answer': 'Energy is the ability to do work. It can be transferred from one object to another and cannot be created or destroyed. Different forms of energy exist, such as kinetic energy and potential energy.'},

{'question_number': 2, 'question': 'What is the difference between radiant energy and thermal energy?', 'right_answer': 'Radiant energy refers to energy created through waves or particles, while thermal energy describes the activity level among atoms and molecules in an object.'},

{'question_number': 3, 'question': 'Discuss the concept of gravitational potential energy with suitable examples.', 'right_answer': 'Gravitational potential energy is the energy stored in an object due to its vertical position or height. Examples of gravitational potential energy include river water at the top of a waterfall and a car parked at the top of a hill.'}}

16. 630 words

INPUT = Organic chemistry is the branch of Chemistry that involves the scientific study of organic compounds (compounds that contain covalently bonded carbon atoms). This branch of chemistry primarily deals with the structure and chemical composition of organic compounds, the physical and chemical properties of organic compounds, and the chemical reactions undergone by these compounds. Advancements in the field of organic chemistry have made numerous contributions to human society, such as the synthesis of several drugs, polymers, and other natural products. Synthetic organic chemistry is an important application of organic chemistry that deals with the design and construction of organic compounds for practical purposes. The term ‘organic’ was coined because the field of organic chemistry was initially finite to compounds that were produced by living organisms. This was attributed to some ‘vital force’ that was present in organic substances as they had something that inanimate substances lacked. The above theory was debunked when Urey Miller synthesised urea from inorganic substances, but the classification is still in use. Organic chemistry is a vast science due to one key property exhibited by the element carbon, which is called carbon catenation. Carbon has the exceptional ability to form very stable bonds with other carbon atoms, giving it the ability to form stable molecules with relatively complex structures. Catenation is the ability of an element to form bonds with an atom of the same kind. Hence, the vastness of organic chemistry can be attributed to this property of carbon. The importance of organic chemistry in the present age is as immense as it has been since its inception. It plays an important role in our everyday life because food, medicines, paper, clothes, soap, perfumes, etc., are indispensable to us for proper living. The study of organic chemistry is important for chemists and pharmacists in synthesising medicines for the alleviation of human suffering. The reactions in organic chemistry occur between organic compounds. Let us now study the different terminologies, classifications, field effects, types of reagents, the stability of intermediates, and properties in detail.

Cleavage of Bonds The reactions in organic chemistry occur through the breaking and making of bonds. Bonds can cleave in either of two ways: Homolytic

cleavage Heterolytic cleavage What Is Homolytic Cleavage? If the covalent bonds between two elements break in such a way that each of the elements gets its own electrons, it is called homolytic cleavage. That is, each element gets an electron. Homolytic cleavage results in the formation of free radicals. What Is Heterolytic Cleavage? If the covalent bonds between two elements break heterolytically, i.e., unequally, it results in the formation of charged species. This type of bond breaking, where the electrons are unevenly distributed, is called heterolytic cleavage. Heterolytic Cleavage Reaction Intermediates in Organic Chemistry Intermediates can be understood as the first product of a consecutive reaction. For example, in a chemical reaction, if $A \rightarrow B$ and $B \rightarrow C$, then B can be said to be the intermediate for reaction $A \rightarrow C$. The reactions in organic chemistry occur via the formation of these intermediates. What Are Carbenes? Carbenes (H_2C) are neutral and reactive species that have six electrons in the outer shell of carbon, making them electron deficient. Since carbenes are species having two odd electrons, we can classify carbenes based on their spin states. Singlet Carbene The electrons are present in different orbitals with opposite spins. The electrons are paired in sp^2 hybridized orbitals and behave as paired electrons. Spin state = $(2S + 1)$, S for singlet carbene is zero, as the electrons are antiparallel. Therefore, spin state = $(2 \times 0 + 1) = 1$ Triplet Carbene Both electrons are present in different orbitals, and they possess the same spin. Spin state = $(2S + 1)$, S for triplet carbene is 1, as both electrons have the same spin. Therefore, spin state = $(2 \times 1 + 1) = 3$ ""

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{'question_number': 3, 'question': '_____ cleavage results in the formation of charged species.', 'right_answer': 'Heterolytic'}],

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{'question_number': 1, 'question': 'Explain the concept of homolytic cleavage with an example.', 'right_answer': 'Homolytic cleavage is a type of bond breaking in which the covalent bonds between two elements break in such a way that each of the elements gets its own electrons. This results in the formation of free radicals. An example of homolytic cleavage is the breaking of the chlorine-chlorine bond in the presence of sunlight, which leads to the formation of two chlorine free radicals.'},

{'question_number': 2, 'question': 'Describe the classification of carbenes based on their spin states.', 'right_answer': 'Carbenes can be classified into singlet and triplet based on their spin states. In a singlet carbene, the electrons are present in different orbitals with opposite spins and behave as paired electrons. The spin state of a singlet carbene is $(2S + 1)$, where S is zero, resulting in a spin state of 1. In contrast, in a triplet carbene, both electrons are present in different orbitals and possess the same spin. The spin state of a triplet carbene is $(2S + 1)$, where S is 1, resulting in a spin state of 3.'},

{'question_number': 3, 'question': 'Explain the concept of intermediates in organic chemistry with an example.', 'right_answer': 'Intermediates can be understood as the first product of a consecutive reaction. For example, in a chemical reaction where A reacts to form B, and B reacts to form C, B can be considered as the intermediate for the reaction from A to C. In organic chemistry, reactions occur via the formation of these intermediates, which play a crucial role in the overall reaction mechanism. These intermediates can be reactive species or stable compounds depending on the specific reaction conditions.'}}}

17. 413 words

INPUT = Waste management Lots of solid waste is generated in the neighbourhood. Apart from household wastes, we also have medical, agricultural, mining and industrial wastes. The improper disposal of these wastes results in environmental pollution. Hence, care must be taken while disposing of these wastes to reduce the pollution levels in our surroundings. Collection and disposal of wastes The domestic waste that is generated is collected into bins and transferred to the municipal workers who take it to the disposable site. At the site, the waste is sorted out and separated as biodegradable and non-biodegradable. The plastic wastes (non-biodegradable wastes) such as bottles, plastic bags etc., are sent for recycling. Whereas the biodegradable wastes are deposited on the land and converted into compost. If the waste is not collected for disposal then it finds its way into the sewers. Some wastes are eaten by the cattle. Non-biodegradable wastes like metal scrap and plastic bags choke the sewers and cause incontinence. Cattles swallow these polythene bags and choke their throat. This makes it difficult for them to breathe and may result in their death. We all should follow the practice of collecting the waste and then disposing it properly. If the waste management technique is not followed then it may result in epidemics due to

groundwater contamination and lead to Water Pollution. It is especially hazardous to the people who directly come in contact with the waste for example rag pickers and the workers involved in waste disposal. These people are largely affected because they do not use any protective devices like gloves and masks while handling the waste. Improper disposal also allows poisonous gases to escape into the atmosphere and cause Air Pollution. Not only this, but the vehicles and industries pump hazardous gases that directly or indirectly affect us and contribute to Air Pollution. Being responsible citizens we should be a part of the proper waste disposal management and cooperate with the government. Throwing waste at inappropriate locations should be avoided. Efforts should be made to reduce vehicular emissions by encouraging the use of Public transport, carpooling and finding greener alternatives to the existing fuel. Encouraging the use of Renewable sources of energy will go a long way in making our planet a safe and healthy place to live in. We have so far seen the significance of waste management. ""

OUTPUT =

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{'question_number': 3, 'question': 'What happens if waste is not collected for disposal?', 'option1': 'It is eaten by cattle', 'option2': 'It causes groundwater contamination', 'option3': 'It results in environmental pollution', 'option4': 'It is deposited on the land', 'right_answer': 'It is eaten by cattle'}]],
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{'question_number': 2, 'question': 'Who are largely affected by improper waste disposal?', 'right_answer': 'Rag pickers'},

{'question_number': 3, 'question': 'What is the main cause of air pollution?', 'right_answer': 'Hazardous gases'}],

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{'question_number': 3, 'question': 'Improper waste disposal allows _____ gases to escape into the atmosphere.', 'right_answer': 'Poisonous'}],

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{'question_number': 1, 'question': 'Discuss the impact of improper waste disposal on groundwater contamination.', 'right_answer': 'Improper waste disposal can lead to contamination of groundwater, which can result in the spread of diseases and health hazards. It is important to properly collect and dispose of waste to avoid this issue.'},

{'question_number': 2, 'question': 'Explain the role of individuals in waste management.', 'right_answer': 'Individuals play a crucial role in waste management by following proper waste disposal practices, reducing waste generation, and promoting sustainable alternatives. By being responsible citizens, we can contribute to a cleaner and healthier environment.'},

{'question_number': 3, 'question': 'What are some ways to reduce vehicular emissions?', 'right_answer': 'Some ways to reduce vehicular emissions include using public transport, carpooling, and exploring greener alternatives to traditional fuel sources. By adopting these practices, we can help mitigate air pollution and promote clean transportation solutions.'}]]

18. 530 words

INPUT = Metals and Nonmetals are different types of materials present around us. Elements can be divided into metals and nonmetals and it is important to know whether a particular element is a metal or nonmetal. Metals (like copper and aluminium) are good conductors of heat and electricity, while nonmetals (such as phosphorus and sulfur) are insulators. Materials are distinguished as above, based on their properties. The Majority elements in the periodic table are metals. This includes alkali metals, transition metals, lanthanides, actinides and alkaline earth metals. Metals are separated by nonmetals on a periodic table through a zigzag line starting from carbon, till radon. The elements between the two are phosphorus, selenium and iodine. These elements and elements right to them in the periodic table are nonmetals. Elements present just to the left of the line are termed as semimetals or metalloids. These will have the combined properties of both metals and nonmetals. Non-metals occupy the upper right-hand portion of the periodic table. Considering the properties of non-metals it is not shiny, malleable or ductile nor are they good conductors of electricity. These properties of non-metals provide one means by which we can distinguish metals from non-metals. Properties of Non-metals have less in common with each other than metals. Their physical and chemical properties vary widely. Some non-metals are solids and some are gases at room temperature. What are Non metals? Very few elements in the periodic table are non-metals. These are present on the right-hand side in the periodic table. Elements that come under non-metals are sulphur, carbon, all halogens, phosphorus, hydrogen, oxygen, selenium, nitrogen and noble gases. In the periodic table, non-metals are located left of the halogens and to the right of the metalloids. Since noble gases and halogens are also non-metals, these elements are often referred to as non-metals.

Properties of Metals Physical Properties of Metals Some physical properties of metals are listed below. Shiny (lustrous) in nature Metal is a good conductor of electricity and heat Density and melting point is high Mouldable (Malleable) Ductile At room temperature, it is in solid form except for mercury Opaque Chemical Properties of Metals Some chemical properties of metals are listed below. Easily corroddible Can lose electrons Form basic oxides Have low electronegativities Good reducing agents

Properties of Non-Metals Physical Properties of Non-metals Some physical properties of non-metals are listed below. Poor conductors of electricity and heat Non-Ductile metals Brittle solids Maybe solids, liquids or gases at room temperature These are not sonorous

Transparent Chemical Properties of Non-metals Some chemical properties of non-metals are listed below. The number of electrons in the outer shell is generally 4-8 Easily gain or lose valence electrons Form acidic oxides whenever they come in contact with oxygen High electronegative elements Great oxidizing agents Non-metals and metals take different forms (allotropes). They have different shapes and properties. Allotropes are elements that exist in two or more than two different physical forms. Example 1: A non-metal carbon – two allotropes of carbon are diamond and graphite. Example 2: A metal such as iron – two allotropes of iron are austenite and ferrite Have a look at the given table depicting the major differences between Metals And Non-metals for better understanding."""

OUTPUT =

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{'question_number': '2', 'question': 'What are the properties of non-metals?', 'option1': 'Shiny, malleable, and good conductors of electricity', 'option2': 'Poor conductors of heat, transparent, and brittle solids', 'option3': 'Metals and nonmetals', 'option4': 'Easily corrodible and good reducing agents', 'right_answer': 'Poor conductors of heat, transparent, and brittle solids'}},
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{'question_number': '3', 'question': 'Which are examples of allotropes?', 'option1': 'Diamond and graphite', 'option2': 'Austenite and ferrite', 'option3': 'Metals and nonmetals', 'option4': 'Alkali metals, transition metals, lanthanides, actinides and alkaline earth metals', 'right_answer': 'Diamond and graphite'}],
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{'question_number': '3', 'question': 'What are the chemical properties of non-metals?', 'right_answer': 'High electronegative elements, form acidic oxides, easily gain or lose valence electrons'}],

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{'question_number': '2', 'question': 'Elements between metals and nonmetals on the periodic table are _____.', 'right_answer': 'metalloids'},

{'question_number': '3', 'question': 'Non-metals are _____ conductors of electricity and heat.', 'right_answer': 'poor'}],

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{'question_number': '1', 'question': 'Explain what allotropes are and give examples.', 'right_answer': 'Allotropes are elements that exist in two or more different physical forms. For example, carbon has two allotropes - diamond and graphite.'},

{'question_number': '2', 'question': 'Discuss the physical and chemical properties of metals.', 'right_answer': 'Metals are shiny, good conductors of electricity and heat, ductile, and malleable. They have high density and melting point. Chemically, metals are easily corrodible and can lose electrons to form basic oxides. They also have low electronegativity and are good reducing agents.'},

{'question_number': '3', 'question': 'What are the properties of non-metals and how do they differ from metals?', 'right_answer': 'Non-metals are poor conductors of heat and electricity, non-ductile, and brittle solids. They may exist as solids, liquids, or gases at room temperature. Non-metals are transparent and not sonorous. Chemically, they have higher electronegativity and tend to gain valence

electrons. Non-metals form acidic oxides and are good oxidizing agents. Compared to metals, non-metals have less in common with each other in terms of physical and chemical properties.'}}}

19. 570 words

INPUT = matter is anything that has mass and occupies space. Pen, paper, clips, sand, air, ice, etc. are different forms of matter. Every matter is made up of tiny particles. These particles are so tiny that they can't be seen with naked eyes. Let's learn about the different characteristics of particles of matter. Characteristics of Particles of Matter As mentioned earlier, every substance is made up of particles. These particles exhibit some characteristics. They can influence the state and properties (physical and chemical) of a substance. The three characteristics shown by particles of matter are as follows. Particles Have Space Between Them There are small voids between every particle in a matter. This characteristic is the concept behind the solubility of a substance in other substances. Let's try to understand this with an illustration. Take a glass of water. Put a teaspoon of salt/sugar and mix them properly. You will observe that the water is still clear. This is because the particles of salt/sugar get into the interparticle spaces between the water particles. This proves that there are voids between particles of a substance. If you add more salt/sugar, it will dissolve until all the space between water particles gets filled. Particles Are Constantly in Motion (or) Particles are Continuously Moving Particles of the matter show continuous random movements. The kinetic energy they possess helps them in this movement. The spreading of ink in a beaker of glass, the smell that comes from agarbattis, etc. are few illustrations that show the movement of particles of a substance. When the particles of two different types of matter intermix on their own, the phenomenon is called diffusion. The diffusion of particles becomes fast when the temperature is increased. A rise in temperature increases the kinetic energy of the particles, making them move more vigorously. Particles Attract Each Other Take an iron rod, a stick of chalk, and a pen. Try to break each one of these. Which one of these is easy to break? The iron rod is stronger than the other two items. What makes an item stronger? Yes, it's the particles in them which are held by the inter-particle force of attraction. In every substance, there is an inter-particle force of attraction acting between its particles. To break something we need to overcome this force. The strength of the force differs from one substance to another. The inter-particle force of attraction and the kinetic energy of the particles primarily determine the

physical state of any matter. **Physical Properties Of Matter** Since a long time, scientists have been researching about chemical and physical properties of matter. In simple terms, they define matter as something which has mass and occupies space (that is volume). Hence, everything we see around us is matter. For example, stars that twinkle, the sun that shines, the food we eat, bricks we used to make buildings, water in oceans and rivers, rocks that form mountains, etc. All of these can be brought under a single umbrella called matter. But does all the matter that we see exhibit the same physical properties? Obviously not, a block of wood is continuous while sand particles are coarse. Similarly, salt particles are soluble in water while sand particles are not. All these properties are known as physical properties. Some physical properties of matter are All matter has mass and occupies some space. They can be broken into millions of tiny pieces further.

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{'question_number': 3, 'question': 'Discuss the importance of inter-particle force of attraction in determining the physical state of matter.', 'right_answer': 'The inter-particle force of attraction plays a crucial role in determining the physical state of matter. It is the strength of this force and the kinetic energy of the particles

that primarily determine whether a substance will exist as a solid, liquid, or gas.}}}

3. PHYSICS (10 tests)

20. 575 words

INPUT = When a ray of light approaches a smooth polished surface and the light ray bounces back, it is called the reflection of light. The incident light ray that land on the surface is reflected off the surface. The ray that bounces back is called the reflected ray. If a perpendicular were drawn on a reflecting surface, it would be called normal. The figure below shows the reflection of an incident beam on a plane mirror. Here, the angle of incidence and angle of reflection are with respect to normal and the reflective surface. **Laws of Reflection** The laws of reflection determine the reflection of incident light rays on reflecting surfaces, like mirrors, smooth metal surfaces and clear water. Let's consider a plane mirror as shown in the figure above. The law of reflection states that The incident ray, the reflected ray and the normal all lie in the same plane The angle of incidence = Angle of reflection . **Types of Reflection of Light** Different types of reflection of light are briefly discussed below: **Regular reflection** is also known as specular reflection **Diffused reflection** **Multiple reflection** **Regular/ Specular Reflection** Specular Reflection refers to a clear and sharp reflection, like the ones you get in a mirror. A mirror is made of glass coated with a uniform layer of a highly reflective material such as powder. This reflective surface reflects almost all the light incident on it uniformly. There is not much variation in the angles of reflections between various points. This means that the haziness and the blurring are almost entirely eliminated. **Diffused Reflection** Reflective surfaces other than mirrors, in general, have a very rough finish. This may be due to wear and tear such as scratches and dents or dirt on the surface. Sometimes even the material of which the surface is made of matters. All this leads to a loss of both the brightness and the quality of the reflection. In the case of such rough surfaces, the angle of reflection when compared between points is completely haphazard. For rough surfaces, the rays incident at slightly different points on the surface is reflected in completely different directions. This type of reflection is called diffused reflection and is what enables us to see non-shiny objects. **Multiple Reflection** A single image is formed when an object is placed in front of a mirror. What happens if we use two mirrors? Since reflective surfaces such as mirrors are very good at preserving the intensity of light in a reflection, a single light source can be reflected multiple times. These multiple reflections are possible until the intensity of light becomes low to the point that we cannot see. This means that we can have almost infinite multiple reflections. We can also see an image in every individual reflection. This means that each image is the result of an image or an image of an

image. The number of images we see depends on the angle between the two mirrors. We see that as we go on decreasing the angle between the mirrors, the number of images increases. And when the angle becomes zero, i.e., when the mirrors become parallel, the number of images becomes infinite. This effect can be easily observed when your barber uses another smaller mirror to show you the back of your head. When this happens, not only do you see the back of your head, but you also see innumerable images of yourself. ""

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{ 'question_number': 2, 'question': 'Describe how multiple reflections occur and the number of images formed.', 'right_answer': 'Multiple reflections occur when a single light source is reflected multiple times by reflective surfaces. The number of images formed depends on the angle between the two mirrors and can be infinite when the mirrors are parallel.' },

{ 'question_number': 3, 'question': 'What is the purpose of a normal in the laws of reflection?', 'right_answer': 'The normal is a perpendicular line drawn on a reflecting surface and is used to measure the angle of incidence and angle of reflection in the laws of reflection.' }] }

21. 500 words

INPUT = What Is an Electric Charge? Atoms are the building blocks of the universe. Whatever you see around you can be divided into smaller and smaller parts until you finally reach a part you cannot divide further. This building block is what we call an Atom. Inside an atom are protons, electrons and neutrons. Out of the three, electrons and protons fit the definition of an electric charge. The protons are positively charged, the electrons are negatively charged, and the neutrons are neutral. A majority of the mass of the atom is concentrated in a very tiny space in the centre called the nucleus and the electrons revolve around this heavy nucleus.

This means that electrons are held very loosely compared to protons. Therefore, the movement of charges here will be restricted to the movement of electrons. Since the atoms are made up of protons and electrons, we can safely conclude that all things are made up of electric charges. The charge of one proton is equal in strength to the charge of one electron. When the number of protons in an atom equals the number of electrons, the atom itself has no overall charge, it is neutral.

Static Electricity Static electricity refers to an imbalance between the electric charges in a body, specifically the imbalance between the negative and the positive charges on a body. The imbalance in the charge is introduced by physical means. One of the most common causes of static electricity is contact between solid objects. It was mentioned earlier that the movement of protons is not possible and the only movement of electric charge seen in static electricity is electrons. Electrons in materials are held extremely loosely meaning that they can be exchanged through simple contact like rubbing. The image below is an example of rubbing a glass rod with silk which causes static electricity. When two objects are rubbed together to create static electricity, one object gives up electrons and becomes more positively charged while the other material collects electrons and becomes more negatively charged. We should keep in mind that the rules such as like charges repel and unlike charges attract is applicable here. Speaking of times when your hair seems to stand on its ends when you remove your cap. Static electricity is the culprit here as well. As you remove your hat, electrons are transferred from hat to hair, creating that interesting hairdo! Remember, objects with the same charge repel each other. Because they have the same charge, your hair will stand on end. Your hair is simply trying to get as far away from each other as possible! The same is true for when you comb your hair repeatedly with a comb. If you bring a comb you have used close to small bits of paper you will see that the comb attracts the pieces of paper. The comb loses electrons while rubbing your hair and this charge imbalance creates static electricity which then attracts the small bits of paper. ""

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{'question_number': 3, 'question': 'When two objects are rubbed together to create static electricity, one object gives up _____ and becomes more positively charged.', 'right_answer': 'electrons'}],

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{'question_number': 2, 'question': 'Describe the process of creating static electricity through rubbing two objects together.', 'right_answer': 'Static electricity is created through the imbalance between negative and positive charges on a body. When two objects are rubbed together, one object gives up electrons and becomes more positively charged, while the other object collects electrons and becomes more negatively charged. This charge imbalance creates static electricity.'},

{'question_number': 3, 'question': 'Explain the phenomenon of static electricity causing objects to repel or attract each other.', 'right_answer': 'Objects with the same charge repel each other, while objects with opposite charges attract each other. This is why your hair stands on end or why a comb attracts small bits of paper when static electricity is present. The charge imbalance created by rubbing or contact causes these interactions.'}]}

22. 823 words

INPUT = Magnets are classified into two groups natural and artificial magnets based on how they achieved their magnetism and for how long they retain their magnetic abilities and on their magnetic field. Natural magnets occur in nature and are much weaker than artificial magnets. Natural magnets – Natural magnets occur in nature and have a weak magnetic field. Lodestones are a common example of natural magnets. Artificial magnets – Artificial magnets can be produced by man-made means and have a stronger magnetic field. They can also be shaped as required. When an artificial magnet is shaped in the form of a bar, it is called a bar magnet. What Is Bar Magnet? A bar magnet is a rectangular piece of an object, made up of iron, steel or any other ferromagnetic substance or ferromagnetic composite, that shows permanent magnetic properties. It has two poles, a north and a south pole such that when suspended freely, the magnet aligns itself so that the northern pole points towards the magnetic north pole of the earth. Types of Bar Magnet There are two types of bar magnets:

Cylindrical bar magnet: A cylindrical rod is also known as a rod magnet that has a thickness equal to larger than the diameter enabling high magnetism property. These bar magnets find application in educational, experimental, and research uses. Rectangular bar magnet: Rectangular bar magnets find applications in manufacturing and engineering industries as they have magnetic strength and field greater than the other magnets.

Properties of Bar Magnet A bar magnet has properties similar to any permanent magnet. It has a north pole and a south pole at two ends. Even if you break a bar magnet from the middle, both the pieces will still have a north pole and a south pole, no matter how many pieces you break it in. Its magnetic force of it is the strongest at the poles. If this magnet is suspended freely in the air with a thread, it will not come to rest until the poles are aligned in a north-south position. A Mariner's Compass uses this property to determine direction. If two bar magnets are placed close to each other, their unlike poles will attract and like poles will repel each other. A bar magnet will attract all ferromagnetic materials such as iron, nickel and cobalt.

Magnetic Field Lines around a Bar Magnet Let us understand the concept of magnetic field lines using the following activity. Let us sprinkle iron filings on a sheet of paper and a bar magnet in between. The magnetic field lines can be defined as imaginary lines that can be drawn along the magnetic field that is acting around any magnetic substance. The magnetic field lines possess certain properties, The magnetic field lines of a magnet form continuous closed loops. The tangent to the field line at any point represents the direction of the net magnetic field B at that point. The larger the number of field lines crossing per unit area, the stronger the magnitude of the magnetic field B . The magnetic field lines do not intersect.

How Are Electromagnets Different from Bar Magnets? Though electromagnets and bar magnets show similar magnetic fields but the following are the differences between them: Most bar magnets are blocks of ferromagnetic materials while electromagnets are coils of wire which sometimes are surrounded by a ferromagnetic core. Electromagnets behave like bar magnets when an electric current is passed through them. Bar magnets generate their own magnetic field while electromagnets depend on the external sources of electric current for the generation of the magnetic field. Bar magnets have a constant magnetic pull as they are permanent magnets while electromagnets do not have a constant magnetic pull as they are controlled by external sources of electric current. The magnetic force of the bar magnet is constant and is dependent on the material it is made from while the magnetic force of an electromagnet can be varied by varying the amount of electricity flowing through the coil.

Uses of Bar Magnet Bar magnets

are used as stirrers in laboratories for magnetic experiments. They also find applications in medical procedures. Electronic devices such as telephones, radios, and television sets use magnets. Many industries use bar magnets for the collection of loose metals and also for retaining the magnetism of other magnets. What Is Pole Strength? Pole strength is defined as the strength of a magnetic pole to attract magnetic materials towards itself. Pole strength is a scalar quantity. Alnico and Neodymium Bar Magnet It will be incomplete to talk about bar magnets and not mention an Alnico bar magnet and a neodymium bar magnet. The primary components of Alnico magnets are aluminium, nickel, cobalt, and iron. These magnets produce a strong magnetic field and retain their magnetic property even under extreme heat. Neodymium bar magnets are made with a mixture of neodymium, boron, and iron. These are both extremely powerful magnets but very brittle."""

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{'question_number': 2, 'question': 'Explain the concept of magnetic field lines using an activity.', 'right_answer': 'Magnetic field lines are imaginary lines drawn along the magnetic field acting around a magnetic substance. They form continuous closed loops, with the tangent to the field line representing the direction of the magnetic field. The number of field lines crossing per unit area determines the strength of the magnetic field. The field lines do not intersect.'},

{'question_number': 3, 'question': 'How are bar magnets different from electromagnets?', 'right_answer': 'Bar magnets are permanent magnets made of ferromagnetic materials, while electromagnets are coils of wire. Bar magnets

generate their own magnetic field, while electromagnets rely on external sources of electric current. The magnetic force of a bar magnet is constant and dependent on the material, while the magnetic force of an electromagnet can be varied by adjusting the electricity flowing through the coil.'}}}

23. 480 words

INPUT = What Is Earth's Magnetic Field Earth's magnetic field is also referred to as the geomagnetic field. The earth's magnetic field extends millions of kilometers into outer space and looks very much like a bar magnet. The earth's south magnetic pole is actually near the North Pole and the magnetic north pole is in Antarctica! This is why a compass magnet's north pole actually points north (north and south poles attract). The Earth's magnetic field extends far and wide but is very weak in terms of field strength. A mere 40,000 nT compared to a refrigerator magnet which has a strength of 10. The Earth's magnetic field extends far and wide but is very weak in terms of field strength. A mere 40,000 nT compared to a refrigerator magnet which has a strength of 107 nT!. **Theory of Earth's Magnetism** There is one theory that explains how the earth's magnetism is caused: **Dynamo effect:** The earth gets its own magnetic field lines because of the presence of the metallic fluids that are present at the outer core as well as in the inner core. The outer core consists of molten iron, while the inner core has the solidified elements. **What Causes Earth's Magnetism?** Earth's Magnetism is generated by convection currents of molten iron and nickel in the earth's core. These currents carry streams of charged particles and generate magnetic fields. This magnetic field deflects ionising charged particles coming from the sun (called solar wind) and prevents them from entering our atmosphere. Without this magnetic shield, the solar wind could have slowly destroyed our atmosphere preventing life on earth to exist. Mars does not have a strong atmosphere that can sustain life because it does not have a magnetic field protecting it. The earth's magnetic poles are not aligned to the actual geographic north and south poles. Instead, the magnetic south pole is in Canada while the magnetic north pole lies in Antarctica. The magnetic poles are inclined by about 10 degrees to the earth's rotational axis. So, all this time your compass was really pointing to Canada, not the true North! **Components of Earth's Magnetic Field** There are three components that are responsible for the magnitude as well as the direction of the earth's magnetic field: **Magnetic declination** **Magnetic inclination** or the angle of dip **Horizontal component** of the earth's magnetic field **Magnetic**

Declination The magnetic declination is defined as the angle between the true north and the magnetic north. On the horizontal plane, the true north is never at a constant position and keeps varying depending upon the position on the earth's surface and time. **Magnetic Inclination** The magnetic inclination is also known as the angle of dip. It is the angle made by the horizontal plane on the earth's surface. At the magnetic equator, the angle of dip is 0° , and at the magnetic poles, the angle of dip is 90° . ""

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{'question_number': 2, 'question': 'The magnetic inclination is _____ at the magnetic equator.', 'right_answer': '0°'},

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{'question_number': 2, 'question': "Why is Earth's magnetic field important for sustaining life?", 'right_answer': "Earth's magnetic field deflects ionising charged particles coming from the sun (solar wind) and prevents them from entering our atmosphere. Without this magnetic shield, the solar wind could slowly destroy our atmosphere, making it impossible for life to exist on Earth."},

{'question_number': 3, 'question': 'Why does Mars not have a strong atmosphere that can sustain life?', 'right_answer': "Mars does not have a magnetic field protecting it, which allows the solar wind to directly interact with and erode its atmosphere. This lack of magnetic shield contributes to Mars' inability to sustain life."}}]

24. 277 words

INPUT = Paramagnetism is a kind of magnetism where several objects are attracted through an externally applied magnetic field. Whereas the diamagnetic materials are repelled by magnetic fields and develop induced magnetic fields in the direction which is opposite to that of the applied magnetic fields. What is Paramagnetism? The paramagnetic material becomes a good magnetic material when placed in the strong magnetic material. It acts as a magnet which attracts and

repels other magnetic and ferromagnetic materials. When the magnetic field is removed, the total magnetic alignment of the magnetic dipoles is lost and the dipole is returned to its normal random motion. This condition is known as Paramagnetism. These materials include most of the chemical elements and some compounds as they have a magnetic permeability greater than or equal to 1. The magnetic moment induced by the applied field is linear to the strength and weakness of the field. It usually needs a sensitive analytical balance to detect the effect and different modern measurements on paramagnetic materials that are often conducted with a SQUID magnetometer. Super Paramagnetism Super Paramagnetism is described as the property as some materials magnetic moments change their direction at the nanoscale and behave like a paramagnet event. According to Curie's law, If there is no magnetic field applied, curie temperature is applied at the same time as they show high magnetic susceptibility. Curie's Law According to this law, the magnetization in the paramagnetic material is inversely proportional to the temperature, which means the more the temperature of the paramagnetic material increases, its magnetization decreases. $M = C(B/T)$ Where, C = Curie constant T = temperature in Kelvin and B = applied magnetic field. ""

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{'question_number': 2, 'question': 'What happens to the magnetic alignment in paramagnetic materials when the field is removed?', 'option1': 'It remains unchanged', 'option2': 'It becomes stronger', 'option3': 'It becomes weaker', 'option4': 'It returns to random motion', 'right_answer': 'It returns to random motion'},
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Law?", 'option1': 'Directly proportional', 'option2': 'Inversely proportional', 'option3': 'No relationship', 'option4': 'Exponentially proportional', 'right_answer': 'Inversely proportional'}],

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{'question_number': 2, 'question': 'What is the Curie temperature related to in paramagnetic materials?', 'right_answer': 'High magnetic susceptibility'},

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{'question_number': 1, 'question': 'Paramagnetic materials have a magnetic permeability greater than or equal to _____', 'right_answer': '1'},

{'question_number': 2, 'question': 'The magnetic moment induced by the applied field is _____ to the strength and weakness of the field.', 'right_answer': 'linear'},

{'question_number': 3, 'question': 'Super paramagnetism is the property where magnetic moments change their direction at the _____ scale.', 'right_answer': 'nanoscale'}],

25. 472 words

INPUT = Permanent Magnets The magnetic field is produced by objects known as magnets. When these properties of magnetism are not lost throughout time it's known as a permanent magnet. Magnetism is shown by ferromagnetic material as well. Some materials are a few alloys of iron and nickel. The way the domains are oriented in a ferromagnetic substance depends on the property of magnetism. The magnetic fields that are produced individually cancel themselves out when the domains are randomly oriented. A collective magnetic field can be produced by reducing the randomization of the domain by influencing it by an electrical field.

This is one of the processes through which electromagnets are produced. But if the domains are already arranged such that they point in the same direction, even without an external influence they will produce a collective magnetic field. These are permanent magnets.

Magnetic Behaviour When imposing a magnetizing field on ferromagnetic substances the domains get arranged to produce magnetism and do not go back to their normal state. When the driving field is zero and even then the domains have not rearranged themselves to normalcy the time the substance takes to demagnetize or remains magnetised for is known as remanence. If we try to put the magnetic property back to zero by applying a field in an opposite direction the amount of that reverse field that's required to demagnetise that substance is known as coercivity. The lack to retain the magnetic property of a substance is known as hysteresis.

Have you ever noticed that an iron nail which has been attached to a magnet for some time attracts other non-magnetic iron nails for a short span even after it has been detached from the magnet? This is because the domains of the iron nail had been reoriented. This effect is weak and is lost pretty soon. Therefore, an iron nail will not be considered as a permanent magnet. The main advantage of a permanent magnet over any other type is that it does not need a continuous supply of external energy (in the case of electromagnets, electricity) to exhibit magnetism. For example, permanent magnets are used as compass needles.

Example of Permanent Magnets An everyday example of a permanent magnet is a refrigerator magnet. The image below shows the magnetic field produced by a bar magnet. The magnetic field is the sphere of influence of the magnet. This can be visualised by sprinkling iron filings on a bar magnet. The filings will arrange themselves on the magnetic field lines of the magnet used. The strength of different magnets can be seen physically in this way. This can be visualised by sprinkling iron filings on a bar magnet. The filings will arrange themselves on the magnetic field lines of the magnet used. The strength of different magnets can be seen physically in this way."""

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```

'Substances that require external energy to exhibit magnetism', 'right_answer': 'Objects that produce a magnetic field'}},

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{'question_number': 3, 'question': 'What is the main advantage of permanent magnets over electromagnets?', 'option1': 'They require a continuous supply of electricity', 'option2': 'They exhibit magnetism without external energy', 'option3': 'They attract non-magnetic substances', 'option4': 'They have a higher coercivity', 'right_answer': 'They exhibit magnetism without external energy'}},

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{'question_number': 2, 'question': 'What is the time taken by a substance to demagnetize or remain magnetized called?', 'right_answer': 'Remanence'}},

{'question_number': 3, 'question': 'What is the lack of ability to retain the magnetic property of a substance known as?', 'right_answer': 'Hysteresis'}},

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{'question_number': 3, 'question': 'Iron filings arrange themselves on the magnetic field lines of a magnet and can be used to physically measure its _____.', 'right_answer': 'Strength'}],

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{'question_number': 2, 'question': 'Describe the magnetic behavior of ferromagnetic substances.', 'right_answer': 'Ferromagnetic substances arrange their domains to produce magnetism when a magnetizing field is imposed on them. They do not return to their normal state even when the driving field is zero, resulting in remanence. The coercivity of a substance is the amount of reverse field required to demagnetize it. Hysteresis refers to the lack of ability to retain the magnetic property.'},

{'question_number': 3, 'question': 'Why are permanent magnets advantageous compared to electromagnets?', 'right_answer': 'Permanent magnets do not require a continuous supply of external energy, such as electricity, to exhibit magnetism. They can maintain their magnetic properties without any external influence.'}]]

26. 700 words

INPUT = When we talk about motion or rest, it is with reference to some point known as the origin. So, now with respect to the change in the position, we have two quantities which can be used to describe that change in position. They are distance and displacement. So now the question is, what is the difference between the two? Talking about distance is defined as the total path length covered during the motion. It can be represented only by magnitude. On the other hand, displacement is the shortest distance between the initial and final positions. It requires both magnitude and direction for complete representation. What Is Motion? We can define motion as the change of position of an object with respect to time. A book falling off a table, water flowing from the tap, rattling windows,

etc., all exhibit motion. Even the air that we breathe exhibits motion! Everything in the universe moves. We live in a universe that is in continual motion. The fundamental particle of matter, that is, the atom, is in constant motion too. Every physical process in the universe is composed of motion of some sort. The motion can either be swift or slow, but motion exists. It is important that we give due attention to the study of motion because of its importance in the physical world. Motion is mainly described in terms of the following terms: Distance

Displacement Speed Time As discussed earlier, distance and displacement are used to describe the change in position. Now, if someone asks what the distance between A and B is, we can't give a definite answer because it depends on the path taken. It may or may not be the same for all three paths. But for displacement, we can always give a definite answer as it is a straight line joining the two points. In other words, displacement is nothing but the shortest distance between the two points, which in this case is Path 2. Also, it has a particular direction from A to B, as we can see. So now that we have a basic idea of both, we will try to solve an example: Suppose the distance between two cities, A and B, is 'd'. A person goes from A to B and returns. Calculate distance travelled and displacement. Distance travelled = Total path length covered = $d + d = 2d$ Displacement is measured as the shortest distance between the initial and final position. In this case, both are the same, and hence, displacement is also zero.

Types Of Motion We might have noticed that different objects move differently. Some objects move in a curved path, some in a straight path and a few others in a different way. According to the nature of the movement, motion is classified into three types as follows: Linear Motion Rotary Motion Oscillatory

Motion Linear Motion In linear motion, the particles move from one point to another in either a straight line or a curved path. The linear motion depending on the path of motion, is further divided as follows Rectilinear Motion – The

path of the motion is a straight line. Curvilinear Motion – The path of the motion is curved. A few examples of linear motion are the motion of the train, football, the motion of a car on the road, etc. Rotary Motion Rotary motion is the motion that occurs when a body rotates on its own axis. A few examples of the rotatory motion are as follows: The motion of the earth about its own

axis around the sun is an example of rotary motion. While driving a car, the motion of wheels and the steering wheel about its own axis is an example of rotatory motion. Oscillatory Motion Oscillatory motion is the motion of a body about its mean position. A few examples of oscillatory motion are When a child on a swing is pushed, the swing moves to and fro about its mean position. The

pendulum of a clock exhibits oscillatory motion as it moves to and fro about its mean position. The string of the guitar when strummed moves to and fro by its mean position resulting in an oscillatory motion. ""

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{'question_number': 3, 'question': 'What are the types of motion?', 'right_answer': 'The types of motion are linear motion, rotary motion, and oscillatory motion.'}]]

27. 780 words

INPUT = What Is Sound? A sound is a form of energy, just like electricity, heat or light. Sound is one of the important senses of the human body. Some sounds are pleasant, and some are annoying. We are subjected to various types of sound all time. Sound waves are the result of the vibration of objects. Let's examine some sources of sounds like a bell. When you strike a bell, it makes a loud ringing noise. Now, instead of just listening to the bell, put your finger on the bell after you have struck it. Can you feel it vibrating? This is the key to sound. It is even more

evident in guitars and drums. You can see the wires vibrating every time you pluck it. When the bell or the guitar stops vibrating, the sound also stops. The to and fro motion of the body is termed vibration. You can see examples of vibrations everywhere. Vibrating objects produce sound. Some vibrations are visible; some aren't. If you pull and then release a stretched rubber band, the band moves to and fro about the central axis and while doing, so it also produces a sound. The sound moves through a medium by alternately contracting and expanding parts of the medium it is travelling through. In physics, the sound is a vibration that propagates as an acoustic wave, through a transmission medium such as a gas, liquid or solid.

Sound Wave Characteristics

After understanding what is sound, let us study the characteristics of the sound wave. The distance between two consecutive peaks or troughs is termed as the wavelength of the wave or the period. The number of cycles per unit time is termed as the frequency of the sound. Frequency is measured in cycles per second or Hertz. The faster an object vibrates, i.e. the higher the frequency, the higher the pitch of the sound. The difference between the voices of a man and a woman must be clearly evident to you. The voice of a man has a lower frequency which contributes to the deepness of the bass in the voice. Women, in contrast, have a voice with higher frequency resulting in a higher shrillness or pitch.

Closing Our Ears When We Hear Loud Noise

If you hear a very loud sound, what do you do? You cover your ears. How do you think that helps? When you cover your ears, you shut off the air inside your ears from the rest of the atmosphere. The sound waves travelling around you are now unable to get through to your ear or the intensity of the sound you hear is greatly reduced. Blocking your ears creates a discontinuity in the medium due to which the flow of sound energy is disturbed. Through this, we can make a very important observation; Sound waves rely on the medium for propagation. The propagation of the sound wave is not possible through the vacuum. The medium here can be gas, liquid or solid. The speed of sound when it is travelling through a medium depends on the type of medium. The speed of sound when travelling through air is 343 m/s or 1,235 km/h.

Speed of Sound

The speed of a sound wave is affected by the type of medium through which it travels. Sound waves travel the fastest in solids due to the proximity of molecules. Likewise, sound waves travel slowest in gases because gases are spread far apart from one another. The state of the medium through which sound travels is not the only factor that affects a sound's speed. The speed of a sound wave can also be affected by the density, temperature, and elasticity of the medium through which the sound waves travel.

Can Sound Travel in Space?

A medium is essential for the propagation of sound.

Sound cannot travel through a vacuum because there are no molecules that can be compressed and expanded in space. Our voice is produced by the vibration of strings known as the vocal cords which are inside Adam's apple. When you make a sound, its vibration travels through the air, and when it reaches your brain through your ears, it is interpreted as sound. In this case propagation of sound takes place through the air medium. How your brain and ear decode pressure variation in sound waves into sound is fascinating! Human Hearing and Speech Humans can hear sounds ranging from 20 Hz to 20 kHz. Sounds with frequencies above the range of human hearing are called ultrasound. Sounds with frequencies below the range of human hearing are called infrasound. The typical sound produced by human speech has frequencies in the order of 100 to 1,000 Hz."''

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28. 777 words

INPUT = What Is Energy? There are different forms of energy on earth. The sun is considered the elemental form of energy on earth. In physics, energy is considered a quantitative property that can be transferred from an object to perform work. Hence, we can define energy as the strength to do any kind of

physical activity. Thus, in simple words, we can define energy as, Energy is the ability to do work. According to the laws of conservation of energy, “energy can neither be created nor destroyed but can only be converted from one form to another”. The SI unit of energy is Joule.

Units of Energy

The International System of Units of measurement of energy is joule. The unit of energy is named after James Prescott Joule. Joule is a derived unit equal to the energy expended in applying a force of one newton through a distance of one meter. However, energy is also expressed in many other units not part of the SI, such as ergs, calories, British Thermal Units, kilowatt-hours, and kilocalories, which require a conversion factor when expressed in SI units.

Different Types of Energy

Although there are many forms of energy, it is broadly categorized into:

Kinetic Energy

Potential Energy . Kinetic Energy Kinetic energy is the energy associated with the object's motion. Objects in motion are capable of causing a change or are capable of doing work. To better understand, let us think of a wrecking ball. A wrecking ball in motion is used to do work such as the demolition of buildings, stones, etc. Even a slow-moving wrecking ball is capable of causing a lot of damage to another object, such as an empty house. However, a wrecking ball that is not in motion does not do any work. Another example of kinetic energy is the energy associated with the constant, random bouncing of atoms or molecules. This is also known as thermal energy. The average thermal energy of a group of molecules is what we call temperature, and when thermal energy is transferred between two objects, it's known as heat.

Different Types of Kinetic Energy: Radiant energy

Radiant energy is the type of energy that travels by waves or particles. This energy is created through electromagnetic waves and is most commonly experienced by humans in the form of heat. Following are a few examples of radiant energy:

When you turn on an incandescent light bulb, it gives off two forms of energy. There is visible light and heat that is generated. Both these generated energies are a form of radiant energy.

Sunlight

is an example of radiant energy.

Thermal Energy

Thermal energy is similar to radiant energy and is experienced in the form of heat or warmth. While radiant energy refers to waves or particles, thermal energy describes the activity level among the atoms and molecules in an object. This is the only difference between radiant energy and thermal energy. Some examples of thermal energy include:

The geothermal energy that comes from the decay of natural minerals and the volcanic action of the earth is an example of thermal energy.

When you heat up the pizza in the oven, you raise the pizza's temperature. The molecules that make up the pizza move more quickly when the pizza is piping hot.

The warmth you

feel emanating from the engine is an example of thermal energy. Sound Energy Humans experience the vibrations that reach the human ear as sound. The disturbance moves in the form of waves through a medium like air and reaches our eardrum. On reaching the eardrum, these vibrations are converted into electrical signals and sent to the brain, which we interpret as the sensation of sound. Electrical Energy The flow of negatively charged electrons around a circuit results in electricity which we more commonly refer to as electrical energy. Mechanical Energy Mechanical energy is the energy associated with the mechanical movement of objects. This type of energy can also be referred to as motion energy. Potential Energy Potential energy is the energy stored in an object or system of objects. Potential energy can transform into a more obvious form of kinetic energy. Different Types Of Potential Energy Gravitational Potential Energy Gravitational potential energy is the energy stored in an object due to its vertical position or height. A book on a high bookshelf has a higher gravitational potential energy than a book on the bottom bookshelf. Gravitational Potential Energy Examples River water at the top of a waterfall A book on a table before it falls A car that is parked at the top of a hill .

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{'question_number': 2, 'question': '_____ is the energy stored in an object due to its vertical position or height.', 'right_answer': 'Gravitational Potential'},

{'question_number': 3, 'question': '_____ energy is the energy stored in an object or system of objects.', 'right_answer': 'Potential'}],

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{'question_number': 2, 'question': 'Describe the difference between radiant energy and thermal energy.', 'right_answer': 'Radiant energy refers to energy that travels by waves or particles, while thermal energy describes the activity level among atoms and molecules in an object. Radiant energy is commonly experienced as heat, while thermal energy represents the overall heat content of an object.'},

{'question_number': 3, 'question': 'Explain how potential energy can transform into kinetic energy.', 'right_answer': "Potential energy is the stored energy in an object

or system. When potential energy is released or used, it can transform into kinetic energy, which is the energy associated with the object's motion. For example, a book on a high shelf has gravitational potential energy, which can transform into kinetic energy when it falls to the ground."}}}

29. 455 words

INPUT = What is Force? Force is an important concept as it influences motion. It can be defined as an interaction that changes the motion of an object if unopposed. But the simple definition of force is that it is the push or pull experienced by any object. Force is a vector quantity, thus it has both magnitude and direction. Therefore, one has to specify both the direction and the magnitude to describe the force acting on an object. Types of Force By applying force, one can make an object at rest move. This application of force can be done either by touching the object or by without touching the object. Therefore, there are two types of forces: Contact force Non-contact force Contact Force The force that is applied to the objects by bringing them into contact. There are three types of contact forces: Frictional force Applied force Normal force Read More: Contact Force Non-Contact Force The force which is applied to the body without coming in contact is known as non-contact force. Gravitational force is an example of non-contact force. Force: Push and Pull For instance, force has been defined as an interaction that changes the motion of an object if unopposed. When this statement is examined closely, we see the role of push-pull in this. A force that changes the direction of an object towards you, would be a pull. On the other hand, if it moves away, it is a push. Sometimes, force is simply defined as a push or pull upon an object resulting from the object's interaction with another object. Hence, any kind of force is basically a push or a pull. Spring and elastic are also types of forces. The moment you push against it, it tends to resist and react or spring back with the same magnitude. Push and Pull Examples Push is defined as the force that is responsible for an object moving from the state of rest. Examples of push: Pushing the trolley. Pushing of the car when it breaks down. Pushing the table from one place to another. The pull is defined as the force that is responsible for an object moving from the state of rest but in the opposite direction when compared to the push. Examples of pull: Pulling the curtain. Dragging the box. Opening of the door. Whenever we consider a force in a given scenario, it can act as an internal as well as an external force depending on the system we have considered. This is how we have introduced this topic from the basics and it

emphasizes the fact that we have to be careful about the system chosen whenever we are labelling a force as an internal or an external force. ""

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{'question_number': 3, 'question': 'Provide an example of a spring or elastic force.', 'right_answer': 'When you push against a spring, it resists and reacts by springing back with the same magnitude.'}]]

4. BIOLOGY (10 tests)

30. 805 words

INPUT = All living organisms have certain common characteristics, such as breathing, growing, requiring nutrition, producing offspring, responding to stimuli, etc., that distinguish them from non-living things. There are certain vital processes that maintain homeostasis and proper functioning of the body, they are called life processes. These processes continue to occur even when we are sleeping or not performing any action. These processes are essential for all living organisms, including plants and animals. These life processes are nutrition, photosynthesis, transportation, metabolism, respiration, reproduction and excretion. In this chapter, we will learn about the details of these processes occurring in plants, animals and human beings in particular. Life Earth happens to be the only known planet having life. There are beings who live, die and become part of nature again. The living organism can be differentiated from the inanimate entities on various parameters of life processes.

Life Process The maintenance of living organisms is essential even if they are moving, resting or even sleeping. The processes which together perform the function of maintenance of 'life' are called as life processes. Nutrition, respiration, circulation, and excretion are examples of essential life processes. In unicellular organisms, all these processes are carried out by a single cell. In multicellular organisms, well-developed systems are present to carry out the processes.

Nutrition The process of acquiring food that is needed for nourishment and sustenance of the organism is called nutrition. There are two main modes of nutrition, autotrophic and heterotrophic. Autotrophic nutrition is present in plants, algae and some bacteria. Organisms produce their own food using light energy or chemical energy through photosynthesis or chemosynthesis, respectively. Heterotrophic nutrition is present in bacteria, fungi and animals. They derive energy from organic compounds, such as animals eating plants or other animals for food. Heterotrophic nutrition has subtypes such as holozoic, saprophytic and parasitic nutrition.

Autotrophic Nutrition If an organism can nourish itself by making its own food using sunlight or chemicals such mode of nutrition is called as autotrophic nutrition. Plants photosynthesize (use light energy) and are called photoautotrophs. Few bacteria use chemicals to derive energy and are called chemoautotrophs.

Photosynthesis Photosynthesis is an important process by which food is formed. The plants make food using sunlight and water, which provides

nourishment to other organisms and themselves. Chlorophyll present in the green parts absorbs light energy. This light energy is used to split water into hydrogen and oxygen. Hydrogen is then used to reduce carbon dioxide into carbohydrates, typically glucose. Chlorophyll is essential for photosynthesis and stomata to facilitate the intake of carbon dioxide. The overall reaction occurring in photosynthesis is as follows: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$. Stomata are pores on the leaves that help in the exchange of gases. They are mostly found on the underside of the leaf. Each stoma is guarded by guard cells, which control the opening and closing of the pore. The water content of the guard cells is responsible for their function.

Saprophytic Nutrition Some organisms feed on dead and decaying organic matter. This mode of nutrition is called saprophytic nutrition. The food is partially digested outside the body, and then it is absorbed. E.g. Fungi are saprophytes.

Parasitic Nutrition Some organisms feed at the expense of another organism and in turn cause harm. This is called the parasitic mode of nutrition. These parasites live on the body or in the body of a host organism and derive the nutrients directly from the body of the host. E.g. Leech is an ectoparasite while Ascaris is an endoparasite. Cuscuta is a parasitic plant.

Amoeba feeds by Holozoic mode of nutrition. It engulfs the food particle using pseudopodia, the process is called phagocytosis. The engulfed food gets enclosed in a food vacuole. As the food vacuole passes through the cytoplasm, digestion, absorption, and assimilation, take place. When the food vacuole opens outside, the egestion of undigested food takes place.

Nutrition in Paramecium Paramecium also exhibits holozoic nutrition. However, they have cilia that help them to engulf the food through the oral groove. A food vacuole is created, enclosing the food. It moves through the cytoplasm, the process is called cyclosis. Food digested in the food vacuole is absorbed by the cytoplasm. Undigested food is given out to a tiny pore called an anal pore or cytopyge.

Nutrition in Humans Humans are omnivores, they can eat plant-based food as well as animal-based food. Being more complex, humans have a very complicated nutrition system. The digestive system has an alimentary canal and associated digestive glands, which together function to nourish the body. There are five stages in human nutrition; Ingestion, Digestion, Absorption, Assimilation and Egestion. Four stages i.e. ingestion, digestion, absorption and egestion, take place in the alimentary canal, while assimilation of food takes place in the whole body.

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{'question_number': 2, 'question': 'What are the essential life processes in living organisms?', 'option1': 'Nutrition', 'option2': 'Photosynthesis', 'option3': 'Transportation', 'option4': 'All of the above', 'right_answer': 'All of the above'},

{'question_number': 3, 'question': 'What is the mode of nutrition in plants?', 'option1': 'Holozoic', 'option2': 'Saprophytic', 'option3': 'Parasitic', 'option4': 'Autotrophic', 'right_answer': 'Autotrophic'}],

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{'question_number': 3, 'question': 'Give one example of a saprophytic organism.', 'right_answer': 'Fungi'}],

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{'question_number': 2, 'question': 'Autotrophic nutrition is present in _____.', 'right_answer': 'plants'},

{'question_number': 3, 'question': '_____ is a mode of nutrition where organisms feed on dead and decaying organic matter.', 'right_answer': 'Saprophytic nutrition'}],

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{'question_number': 2, 'question': 'Describe the different modes of nutrition.', 'right_answer': 'There are two main modes of nutrition, autotrophic and heterotrophic. Autotrophic nutrition is present in plants, algae, and some bacteria. These organisms produce their own food using light energy or chemical energy through photosynthesis or chemosynthesis, respectively. Heterotrophic nutrition is present in bacteria, fungi, and animals. They derive energy from organic compounds, such as animals eating plants or other animals for food. Heterotrophic nutrition has subtypes such as holozoic, saprophytic, and parasitic nutrition.'},

{'question_number': 3, 'question': 'Explain the process of digestion in humans.', 'right_answer': 'Digestion in humans starts with ingestion, where food is taken into the mouth. It then goes through the alimentary canal, which includes the esophagus, stomach, small intestine, and large intestine. In these organs, the food is broken down into smaller molecules through mechanical and chemical processes. The nutrients are absorbed by the walls of the small intestine and transported to the cells of the body through the bloodstream. The waste products are eliminated through the rectum and anus in the process of egestion.'}}]

31. 1101 words

INPUT = Alimentary Canal The alimentary canal in humans is a long tube of varying diameter. It starts with the mouth and ends with the anus.

Oesophagus, stomach, small intestine and large intestine are the parts of the alimentary canal. Mouth It is the opening of the alimentary canal and helps in

the ingestion of food. The buccal cavity, which is present behind the mouth, is also commonly referred to as the mouth. The buccal cavity has teeth and a tongue. The set of teeth helps in the mastication of food. The tongue has taste buds on it and thus helps in tasting the food. The salivary glands also open in the buccal cavity and pour saliva, which initiates the process of digestion.

Teeth Teeth are the hard structures present in the buccal cavity. They help us to cut, shear and masticate the food we eat. The vertical section of a tooth shows four layers enamel, dentine, cement and dental pulp. Enamel is the outermost, shiny, highly mineralized and hardest part of the human body. Dentine makes the bulk of the tooth and contains 70% inorganic salts. Cement is present at the lining of a tooth and bony socket. The dental pulp is the central soft part of a tooth and contains nerve endings, blood and lymph vessels along with connective tissue. There are four types of teeth in humans, Incisors, canines, molars and premolars, each with a specific function. Incisors cut the food, canines tear the food while molars and premolars crush it. The dental formula in adult humans is 2:1:2:3.

Oesophagus & Stomach

Oesophagus The swallowed food passes into the oesophagus. It is a muscular tube, about 25 cm long, with a sphincter (valve/opening) at each end. Its function is to transport food and fluid, after being swallowed, from the mouth to the stomach. Food is pushed down by peristaltic movements.

Stomach The stomach is a thick-walled bag-like structure. It receives food from the oesophagus at one end and opens into the small intestine at the other end. The inner lining of the stomach secretes mucous, hydrochloric acid and digestive juices. Food is churned into a semi-solid mass in the stomach and is called chyme. Enzymes present in gastric juice break down the food. Hydrochloric acid helps in the partial digestion of proteins and also kills harmful bacteria. The mucus secreted by the wall of the stomach resists the action of HCl on itself.

Small Intestine The small intestine is the longest part of the alimentary canal, about 20 feet long in humans. It has regions, the duodenum, the region which follows the stomach; the jejunum is the middle part; and the ileum is the later region which continues further into the large intestine. The internal surface of the small intestine is folded into finger-like projections called villi. A common pancreatic duct from the pancreas and liver opens into the duodenum. Most of the chemical digestion and absorption takes place in the small intestine.

Large Intestine The large intestine in humans is about 5 feet long. It has two regions, the colon (about 1.5 m) and the rectum (10 cm in length in the adult). The region of the large intestine after the ileum is called the colon, while the last

part is called the rectum. Colon has three regions, ascending colon, transverse colon and descending colon. At the base of the ascending colon, a small finger-like out-growth is seen and is called an appendix. It houses many useful bacteria required for the digestion of food. Rectum opens to the outside by the anus. The anus has internal and external anal sphincters. Peristalsis A constant wave-like movement of the alimentary canal right from the oesophagus to the small intestine is called as peristalsis. Muscles present in the wall of the alimentary canal are responsible for peristalsis. This movement helps to push the food through the alimentary canal. Digestive Glands Several glands produce digestive juices that help in the digestion of food. Salivary glands, gastric glands, liver, gallbladder, and pancreas are a few to name. Salivary glands secrete saliva, which initiates digestion in the mouth itself. Gastric glands present in the wall of the stomach secrete hydrochloric acid and the enzyme pepsin. The liver secretes bile which is stored in the gallbladder. Bile helps in the digestion of fats. The pancreas secretes many digestive enzymes, and its secretion is called pancreatic juice. Enzymes like trypsin, chymotrypsin, lipase, and amylase are present in pancreatic juice. Pancreas The pancreas is a long, flat gland present behind the stomach in humans. It is one of the major digestive glands and is of mixed nature, i.e. endocrine as well as exocrine. As an endocrine organ, it secretes two hormones called insulin and glucagon which maintain the blood sugar level. As an exocrine gland, it secretes pancreatic juice, which is nothing but a mixture of many digestive enzymes. The digestive enzymes secreted by the pancreas include trypsin and chymotrypsin, and proteases which digest proteins. It also includes amylase, which digests the starch content of the food. Pancreatic lipases are the pancreatic enzymes that help in the digestion of fats. Holozoic Nutrition The mode of nutrition in which animals take their food as a whole is called as holozoic nutrition. In holozoic nutrition, food passes through five steps – ingestion, digestion, absorption, assimilation and egestion. Physiology of Digestion Mechanical digestion of food takes place in the buccal cavity where teeth masticate the food, saliva gets mixed, and it turns into a bolus. Digestion of starch starts in the buccal cavity itself, with the action of salivary amylase present in the saliva. Salivary amylase converts starch into maltose. In the stomach, the churning of food takes place due to the muscular contraction and relaxation of its wall. It breaks down the food into simpler substances. Digestion of proteins starts in the stomach with the action of pepsin. Proteins are broken down into smaller fragments called peptides by the action of pepsin. The bolus, after mixing with gastric juice, turns into a fine soluble

form known as chyme. Chyme enters the small intestine, where complete digestion takes place due to the action of various enzymes present in the pancreatic juice, bile and intestinal juice. The digested food is completely absorbed by the villi and microvilli of the small intestine. Undigested food then enters the large intestine. The colon is responsible for the absorption of water and salts, whereas the rectum stores the undigested food temporarily before defaecation.

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to stomach', 'option3': 'To absorb nutrients in the small intestine', 'option4': 'To cut,  
shear and masticate food', 'right_answer': 'To transport food and fluid from the  
mouth to stomach'},
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feet long in humans?', 'right_answer': 'Small intestine'},
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take their food as a whole called?', 'right_answer': 'Holozoic nutrition'}],
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{'question_number': 2, 'question': '_____ helps in the mastication of food.', 'right_answer': 'Teeth'},

{'question_number': 3, 'question': 'The swallowed food passes into the _____.', 'right_answer': 'oesophagus'}],

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{'question_number': 2, 'question': 'Describe the role of the pancreas in digestion.', 'right_answer': 'The pancreas is a long, flat gland located behind the stomach. It serves as both an endocrine and exocrine gland. As an endocrine organ, it secretes insulin and glucagon to regulate blood sugar levels. As an exocrine gland, it produces pancreatic juice containing digestive enzymes. These enzymes, including trypsin, chymotrypsin, lipase, and amylase, aid in the breakdown of proteins, fats, and starches respectively. Pancreatic lipases are specifically involved in the digestion of fats.'},

{'question_number': 3, 'question': 'Discuss the process of digestion in the buccal cavity and stomach.', 'right_answer': 'In the buccal cavity, mechanical digestion occurs as the teeth masticate the food and mix it with saliva, forming a bolus. Salivary amylase present in the saliva starts the digestion of starch, breaking it down into maltose. In the stomach, the churning of food takes place due to the contraction and relaxation of its muscular wall. Pepsin, an enzyme present in gastric juice, initiates the digestion of proteins by breaking them into smaller fragments called peptides. The bolus, mixed with gastric juice, transforms into a

soluble form known as chyme. At this stage, the food is partially digested and ready to enter the small intestine for further digestion and absorption.'}}}

32. 751 words

INPUT = Digestive System in Other Animals Digestive systems in different animals vary in structure and function. The structure of the digestive system depends on the food habits of the animal. The alimentary canal in herbivores is long as the cellulose content of their plant-based diet takes a long time to digest. On the other hand, the alimentary canal of carnivorous animals is comparatively shorter because meat gets digested faster. **Anatomy of Digestive Tract** The alimentary canal in humans is approximately 30 feet (9m) long. It is also called the gastrointestinal tract. It starts in the mouth and ends in the anus. Between these two openings, the alimentary canal is a tube of varying diameter. Oesophagus, stomach, small intestine (divided into three regions, duodenum, jejunum and ileum) and large intestine(having two regions, colon and rectum) are the parts of the alimentary canal. Salivary glands, pancreas and liver act as major digestive glands. Glands present in the wall of the stomach and small intestine also contribute to the digestion of food. **Role of HCl** Hydrochloric acid in the stomach is secreted by the gastric glands present in its wall. the pH of gastric acid is usually between 1.5 to 3.5 This acid serves the following functions: Converts inactive pepsinogen and pro-rennin into active pepsin and rennin, respectively. Provides an acidic medium for protein digestion. Kills bacteria entered through food and prevents infection. Prevents putrefaction of food in the stomach. A thick layer of mucus secreted by the mucous glands of the stomach prevents itself from the action of gastric acid.

Excess acid damages gastric mucosa and causes gastric and duodenal ulcers. **Salivary Glands** Salivary glands are the exocrine glands that secrete saliva, and through a system of ducts, it is poured into the mouth. In humans, three major pairs of salivary glands are present, parotid, submandibular and sublingual. In healthy individuals, between 0.5 to 1.5 litres of saliva is produced per day. Saliva serves the following functions in the oral cavity: It lubricates and protects the soft and hard tissues of the oral cavity It also gives protection from dental caries Saliva prevents microbial growth in the oral cavity. Saliva can encourage soft tissue repair by decreasing clotting time and increasing wound contraction. Saliva contains the enzyme amylase that hydrolyses starch into maltose and dextrin. Hence saliva allows digestion to occur before the food reaches the stomach. Saliva acts as a solvent in which solid

particles can dissolve and enter the taste buds located on the tongue.

Heterotrophic Nutrition When an organism depends on others for food, such a mode of nutrition is called as a heterotrophic mode of nutrition. These organisms depend on autotrophs for their nutritional requirements. E.g. Animals which eat plants as their food are called herbivores. Animals which eat other animals as their food are called carnivores. Holozoic, saprophytic and parasitic nutrition are all types of heterotrophic nutrition.

Glandular Epithelium Many small glands present in the inner layer of the stomach and intestine take part in the digestion of food. These glands are present in the epithelial lining of the stomach and intestine. The glands present in different regions of the stomach are called gastric glands. They are responsible for the secretion of mucus, hydrochloric acid and enzymes like pepsinogen. The glands present in the epithelial lining of the small intestine and large intestine are called intestinal glands. Glands of the small intestine are responsible for the secretion of intestinal juice, also called succus entericus. Intestinal juice contains hormones, digestive enzymes, alkaline mucus, and substances to neutralize hydrochloric acid coming from the stomach. Intestinal juice completes the digestion started by the pancreatic juice. Glands of the large intestine are associated with the absorption of water and electrolytes.

Villi and Micro Villi Complete digestion and absorption of food take place in the small intestine. Pancreatic juice coming from the pancreas, bile from the liver and intestinal juice secreted by the intestinal glands complete the digestion of food material. All the digested nutrients are absorbed by the long finger-like projections present in the ileum of the small intestine. These small finger-like projections of the inner wall of the intestine are called villi (singular: villus). Each villus has its cell membrane of the lumen side again folded into microscopic processes called microvilli. Villi increase the internal surface area of the intestinal walls making available a greater surface area for absorption. Digested nutrients pass into the semipermeable villi through diffusion. Villi also help in the chemical digestion of food by secreting digestive enzymes.

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{'question_number': 2, 'question': 'What is the function of saliva in the oral cavity?', 'option1': 'Digestion of starch', 'option2': 'Protection from dental caries', 'option3': 'Preventing microbial growth', 'option4': 'All of the above', 'correct_answer': 'All of the above'},

{'question_number': 3, 'question': 'Where does the villi absorb the digested nutrients?', 'option1': 'Stomach', 'option2': 'Liver', 'option3': 'Small intestine', 'option4': 'Large intestine', 'correct_answer': 'Small intestine'}],

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{'question_number': 2, 'question': '____ acid in the stomach is secreted by the gastric glands present in its wall.', 'right_answer': 'Hydrochloric'},

{'question_number': 3, 'question': 'Saliva contains the enzyme amylase that hydrolyses starch into _____ and dextrin.', 'right_answer': 'maltose'}],

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{'question_number': 2, 'question': 'Explain the role of HCl in the stomach.', 'right_answer': 'HCl converts inactive pepsinogen and pro-rennin into active pepsin and rennin, provides an acidic medium for protein digestion, kills bacteria, and prevents putrefaction of food.'},

{'question_number': 3, 'question': 'Describe the structure and function of villi in the small intestine.', 'right_answer': 'Villi are small finger-like projections in the inner wall of the intestine that increase the surface area for absorption. They also secrete digestive enzymes and aid in the chemical digestion of food.'}}}

33. 340 words

INPUT = The liver is the largest and major digestive gland of humans. The liver, in humans, is located in the upper right-hand portion of the abdomen. This organ is dark reddish-brown in colour due to an extensive blood supply. Some of the important functions of the liver are as follows: It secretes bile which helps in digestion. It filters the blood coming from the digestive tract before passing it to the rest of the body. It detoxifies various metabolites and antidotes. The liver makes proteins important for blood clotting and other functions. It stores and releases glucose as needed. It processes haemoglobin from the dead and worn-out RBCs, for the iron content (the liver stores iron). The conversion of harmful ammonia to urea takes place in the liver.

Digestive Juices Pancreatic juice, bile and intestinal juice (succus entericus) are collectively called digestive juices. A common duct from digestive glands pours the secretions into the duodenum. Chyme enters the small intestine, where complete digestion takes place due to the action of various enzymes. In the duodenum, the acidity of chyme is turned to alkalinity by the action of bile coming from the liver. This is necessary for pancreatic enzyme action. Bile also emulsifies the fats into smaller globules. Pancreatic and intestinal amylases break down carbohydrates into glucose. Trypsin and chymotrypsin are the proteases responsible for the breakdown of proteins finally into amino acids. Lipase is the enzyme which acts on the emulsified fats and breaks them down into glycerol and fatty acids.

Water Absorption in Large

Intestine The large intestine is not involved in the digestion of food or absorption of nutrients. The major function of the large intestine is to absorb water from the remaining indigestible food matter and make the stool solid. The large intestine also helps in the absorption of vitamins made by bacteria that normally live in the large intestine. The innermost layer of the large intestine also acts as a barrier and protects from microbial infections and invasions. Rectum stores the undigested food temporarily until defecation.

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{'question_number': 2, 'question': 'Describe the process of water absorption in the large intestine.', 'right_answer': 'The large intestine absorbs water from indigestible food matter to make the stool solid. It also absorbs vitamins produced by bacteria in the intestine. Additionally, the innermost layer of the large intestine acts as a barrier against microbial infections and invasions. The undigested food is temporarily stored in the rectum until defecation.'},

{'question_number': 3, 'question': 'Discuss the role of bile in digestion.', 'right_answer': 'Bile, produced by the liver, helps in digestion by emulsifying fats into smaller globules. It also turns the acidity of chyme in the duodenum to alkalinity, which is necessary for pancreatic enzyme action. This enables the breakdown of carbohydrates into glucose by pancreatic and intestinal amylases, and the breakdown of proteins into amino acids by trypsin and chymotrypsin.'}}]

34. 403 words

INPUT = Respiration Introduction to Respiration Respiration broadly means the exchange of gases. Animals and plants have different means of exchange

of gases. At a cellular level, respiration means the burning of food to generate the energy needed for other life processes. Cellular respiration may take place in the presence or absence of oxygen. **Respiration in Humans** The human respiratory system is more complex and involves breathing, the exchange of gases and cellular respiration. A well-defined respiratory system helps with breathing and the exchange of gases. Breathing involves the inhalation of oxygen and the exhalation of carbon dioxide. The gaseous exchange takes place in the lungs, and oxygen is supplied to all cells of the body. Cellular respiration takes place in each and every cell. **Respiratory System** The human respiratory system involves the nose, nasal cavities, pharynx, larynx, trachea/windpipe, bronchi, bronchioles and alveoli. Bronchioles and alveoli are enclosed in a pair of lungs.

The rib cage, muscles associated with the rib cage and diaphragm all help in the inhalation and exhalation of gases. The exchange of gases takes place between an alveolar surface and surrounding blood vessels. Alveoli provide a large surface area for the exchange of gases. **Physiology of Respiration**

Breathing in humans is facilitated by the action of internal intercostal and external intercostal muscles attached to the ribs and the diaphragm. When the dome-shaped diaphragm contracts and becomes flattened and the rib cage is expanded due to the action of intercostal muscles, the volume of the lungs increases, pressure there drops down and the air from outside gushes in. This is inhalation. To exhale, the diaphragm relaxes and becomes dome-shaped again; the chest cavity contracts due to the action of intercostal muscles, the volume inside the lungs decreases, pressure increases and the air is forced out of the lungs.

Inhaled air increases the concentration of oxygen in the alveoli, so oxygen simply diffuses into the surrounding blood vessels. Blood coming from cells has more concentration of carbon dioxide than outside air, and thus carbon dioxide simply diffuses out of the blood vessels into the alveoli. Thus, breathing takes place due to the combined action of intercostal muscles and the diaphragm, while the exchange of gases takes place due to simple diffusion. **Inhalation and Exhalation** The process of taking in air rich in oxygen is called inhalation. Similarly, the process of giving out air rich in carbon dioxide is called exhalation. One breath comprises one inhalation and one exhalation. A person breathes several times a day. The number of times a person breathes in one minute is termed as his/her breathing rate.

OUTPUT =

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35. **421 words**

INPUT = Diffusion Diffusion is the movement of molecules from high concentration area to the low concentration area without spending any energy.

Cellular Respiration Cellular respiration is set of metabolic reactions occurring inside the cells to convert biochemical energy obtained from the food into a chemical compound called adenosine triphosphate (ATP). Metabolism

refers to a set of chemical reactions carried out to maintain the living state of the cells in an organism. These can be divided into two categories: Catabolism – the process of breaking molecules to obtain energy. Anabolism – the process of synthesizing all compounds required by the cells.

Therefore, respiration is a catabolic process which breaks large molecules into smaller ones, releasing energy to fuel cellular activities. Glycolysis, Krebs cycle, and electron transport chain are the important processes of cellular respiration. **Aerobic Respiration**

Aerobic respiration is a process in which the food i.e. glucose is converted into energy in the presence of oxygen. The general equation of aerobic

respiration as a whole is given below- $\text{Glucose} + \text{oxygen} \Rightarrow \text{Carbon dioxide} + \text{Water} + \text{Energy}$ This type of respiration takes place in animals, plants and

other living organisms. **Respiration in Lower Animals** Lower animals lack a sophisticated respiratory system like lungs, alveoli etc. Respiration in them

takes place by simple exchange mechanisms. Animals like earthworms take in

gases through their skin. Fishes have gills for gaseous exchange. Insects have a tracheal system, which is a network of tubes through which air circulates and gaseous exchange takes place. Frogs breathe through their skin when in water and through their lungs when on land. Respiration in Muscles Respiration in muscles can be anaerobic when there is not enough oxygen. Glucose gets broken down into carbon dioxide and lactic acid. This results in the accumulation of lactic acid that makes the muscles sore. This type of anaerobic respiration is also known as lactic acid fermentation. ATP It is the energy currency of the cell. ATP stands for Adenosine Tri-Phosphate.

This molecule is created.; as a result, reactions like photosynthesis, respiration etc.

The three phosphate bonds present in the molecule are high-energy bonds, and when they are broken, a large amount of energy is released. Such released energy is then used for other metabolic reactions. Respiration in Plants Unlike animals and humans, plants do not have any specialized structures for gaseous exchange. They have stomata (present in leaves) and lenticels (present in stems), which are involved in the exchange of gases. Compared to animals, plant roots, stems, and leaves respire at a very lower rate.

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stages: glycolysis, Krebs cycle, and electron transport chain. Glycolysis is the initial step in which glucose is broken down into pyruvate. The Krebs cycle involves the conversion of pyruvate into carbon dioxide, releasing energy-rich molecules. Finally, in the electron transport chain, energy is used to generate ATP. Overall, cellular respiration is essential for fueling cellular activities.'},

{'question_number': 2, 'question': 'Explain the process of diffusion.', 'right_answer': 'Diffusion is the movement of molecules from an area of high concentration to an area of low concentration without spending any energy. It occurs due to the random motion of molecules, which leads to their distribution evenly throughout the available space. Diffusion is an important process in various biological and physical systems, such as gas exchange in lungs, nutrient absorption in cells, and the mixing of substances in solutions.'},

{'question_number': 3, 'question': 'Discuss the types of respiration in different organisms.', 'right_answer': 'Respiration in different organisms can vary depending on their structures and environments. In lower animals, such as earthworms and insects, respiration takes place through simple exchange mechanisms, either through the skin or through specialized organs like gills or the tracheal system. In animals like frogs, respiration can occur through both the skin (when in water) and the lungs (when on land). Plants, on the other hand, rely on stomata and lenticels in their leaves and stems for gaseous exchange. Overall, respiration is crucial for all organisms to obtain the necessary oxygen and release waste gases like carbon dioxide.'}}}

36. 328 words

INPUT = Transpiration is a biological process in which water is lost in the form of water vapour from the aerial parts of the plants. This process occurs mainly through the stomata, where the exchange of gases (oxygen and carbon dioxide) occurs.

Transpiration helps in the transportation of water from roots to the upper parts of plants, and this is explained by the ‘transpirational pull theory’.

Loss of water, especially from leaves, acts as a straw effect and pulls water upwards from roots.

Transpiration also acts as an excretory mechanism in plants as it helps to get rid of excess water.

In unicellular organisms like amoeba exchange of gases takes place through a general body surface by osmosis.

In lower animals like an earthworm, the gaseous exchange takes place through their moist skin. The requirement for oxygen is sufficiently met in these ways.

But as the animal starts becoming more and more complex, for example, humans, the requirement for oxygen cannot be met alone by diffusion. Moreover, diffusion will not be able to supply oxygen to the deep-seated cells. This difficulty has led to the evolution of a more complex mechanism of gaseous exchange, and that is the development of lungs. The alveoli present in the lungs provide a large surface area required for the necessary gas exchange.

Transportation in Human Beings

All living organisms need a few necessary components like air, water, and food for their survival. On a regular basis, animals ensure these elements by breathing, drinking and eating. The required elements are transported to their body cells and tissues by a transportation system. In plants, the vascular tissue is responsible for transporting the substances.

Transportation in Humans

Transportation in humans is done by the circulatory system. The circulatory system in humans mainly consists of blood, blood vessels and the heart. It is responsible for the supply of oxygen and nutrients and the removal of carbon dioxide and other excretory products. It also helps to fight infections.

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{'question_number': 2, 'question': 'Describe the transportation system in humans.', 'right_answer': 'Transportation in humans is done by the circulatory system. The circulatory system in humans mainly consists of blood, blood vessels, and the heart. It is responsible for the supply of oxygen and nutrients and the removal of carbon dioxide and other excretory products. It also helps to fight infections.'},

{'question_number': 3, 'question': 'How does the process of gaseous exchange become more complex in animals?', 'right_answer': 'As the animal starts becoming more and more complex, for example, humans, the requirement for oxygen cannot be met alone by diffusion. Moreover, diffusion will not be able to supply oxygen to the deep-seated cells. This difficulty has led to the evolution of a more complex mechanism of gaseous exchange, and that is the development of lungs. The alveoli present in the lungs provide a large surface area required for the necessary gas exchange.'}}}

37. 457 words

INPUT = Diversity in the living world is immense, with millions of species of organisms identified to date. The world that we live in is over 4.6 billion years old, and within that span of time, evolution has led to innumerable and spectacular biodiversity in the living world. But what exactly is “life”, and how is it defined? Over the ages, the definition of “life” has been widely disputed, and often, life was attributed to characteristics such as movement, mobility and growth. At a certain point in history, plants were considered non-living. But today, we can tell apart all the organisms that we see into “living” and “non-living.” But when we delve deeper – into the microscopic scale, the line between the two is even more blurred. What is Living? We do know that all living organisms reproduce, grow and metabolize. But when we look at the microscopic realm, the actual definition of life is rather blurred. For instance, viruses are basically nucleic acid that is protected by a protein coat. They exhibit no typical characteristics of living organisms, such as reproduction, until and unless it is inside a host. Another “organism” that borders between the living and non-living are Prions. These are essentially misfolded proteins that can reproduce by making other healthy proteins misfold. These entities are responsible for causing diseases such as Spongiform Encephalopathy, and fatal familial insomnia, which are almost always fatal. In conclusion, the realm between the living and the non-living differs even now as the definition of “life” is ambiguous. Characteristics of Life Living organisms

exhibit undisputable signs of life – such as growth, reproduction and metabolism. Higher organisms such as humans showcase consciousness – where we become aware of our surroundings. Similarly, consciousness may be observable in many lower forms of life, such as bacteria and protozoa. When these organisms engulf food or react to their environment, it is done primarily to ensure survival. iversity in the Living World In response to the sheer number of organisms discovered to date, a system of standardizing names was implemented. Binomial nomenclature assigns a two-part scientific name to an organism. Botanists and zoologists follow set principles and criteria when assigning a scientific name to an organism. For instance – plant names are assigned based on the principles and criteria set by the International Code for Botanical Nomenclature (ICBN). Similarly, animal names are assigned on the basis of the International Code of Zoological Nomenclature (ICZN). Classification of organisms according to the aforementioned conventions involved a hierarchy of steps, with each step representing a category or a rank. The most basic unit of classification is species. A species is a group of individual organisms with fundamental similarities.

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38. 951 words

INPUT = What is a Cell? A cell is defined as the most basic, structural and functional unit of all living organisms. Essentially, a cell is a structure that contains organelles which provide the necessary functions to sustain itself. However, not all cells are the same. Plants have cells that are vastly different from animals. One of the primary differences between the two is the absence of cell walls in animal cells. Cells also vary in size, with the largest one in the human body being the egg or the female ovum. It measures roughly 1 millimetre across.

The smallest cell is the granule cell which is found in the human cerebellum, measuring roughly around 4.5 micrometres in size.

Cell Theory

This scientific theory, initially formulated by Matthias Schleiden and Theodor Schwann, proposed that all living organisms are composed of cells, and new cells are formed from pre-existing cells. Even though the theory was put forth by Schleiden and Schwann, other notable scientists have contributed to this theory, turning its status from a theory to a universally accepted fact.

Prokaryotic Cells

Prokaryotic cells are unicellular microorganisms and one of the most ancient organisms on earth. There are many types of prokaryotes, some of which are extremophiles. Others are photoautotrophic, able to produce nutrients from the energy of the Sun. A typical prokaryotic cell is made up of a single membrane, and therefore, all the reactions occur within the cytoplasm. They can be free-living or can be found within the gut of other organisms, such as ruminants (cows and buffaloes).

Eukaryotic Cells

Unlike prokaryotic cells, eukaryotic cells possess a nucleus enclosed within a membrane. All multicellular organisms are eukaryotic, and they fall under the domain of Eukaryota. Structurally, eukaryotic cells are much larger than prokaryotic cells, typically having a volume 10,000 times greater than prokaryotic cells. Eukaryotic cells also possess many membrane-bound organelles devoted to various life functions.

Cell Organelles

Eukaryotes possess many cellular organelles that perform various functions. Some of these organelles, such as the cell wall, are exclusive to plant cells.

Cell Membrane	Cell wall
Mitochondria	Plastids
Ribosomes	Cytoskeletons
Centrosome	Centrioles
Nucleus	Microbodies
Cilia and Flagella	Endomembrane

systems which consist of the endoplasmic reticulum and Golgi apparatus. Plant cells have centrally placed vacuoles.

What is the Cell Cycle?

Essentially, the cell cycle is an orderly sequence of events that occur before the cell actually divides and gives rise to new cells. This is a very important process and has varying implications from growth and development to repair of the organism.

Mitosis

This is one of the two types of cell division where a single cell divides into two genetically identical daughter cells. In unicellular organisms, this type of cell division typically contributes to asexual reproduction. In multicellular organisms, mitosis is helpful for the growth and repair of damaged cells. Mitosis is also called equational division.

Meiosis

Also called reduction division, meiosis is another type of cell division that commonly occurs during sexual reproduction. Here, the chromosomes in the parent cell reduce by half, forming four gamete cells which are genetically distinct from the parent cells. Meiosis is very significant as it provides genetic diversity among a population. When Cell Division Goes Wrong

Cells have many mechanisms that dictate when to divide and when to stop. When these mechanisms fail, the end result is usually cancer. Cells divide at the right time and at the right order. Such abnormalities can result in the chromosomes being damaged or destroyed. When cancer cells that are initially benign lose or gain faulty chromosomes, it can become malignant, often becoming life threatening.

What is Cytokinesis? Cytokinesis is the process where the cytoplasm of a parental cell splits into two daughter cells. Moreover, the process occurs concurrently with meiosis and mitosis in animal cells.

Describe the quiescent phase of the cell cycle. The quiescent phase refers to the G₀ state where the cells reside in an inactive state (hence the term “quiescent”) before beginning with the cell cycle after activation in response to extrinsic signals.

What is mitosis? Mitosis is a type of cell division where two daughter cells are formed possessing the same number and kind of chromosomes as their parent’s nucleus. It predominantly occurs during the growth of normal tissues.

What is the significance of meiosis? Meiosis is very important because it ensures that the organisms which are born through sexual reproduction possess the correct number of chromosomes. If the number of chromosomes deviates from the standard, the organism may develop genetic abnormalities.

What are Biomolecules? All the carbon-based compounds that are found in or produced by organisms and are essential to a biological process are called biomolecules. Examples of biomolecules include proteins, lipids, carbohydrates and nucleic acids. Even molecules such as metabolites (primary and secondary) are considered as biomolecules.

Enzymes Most enzymes discovered to date are proteins. There are even nucleic acids that exhibit characteristics of enzymes are called ribozymes. Enzymes are similar to proteins, wherein, it possesses a primary structure as well as secondary and tertiary structures. In the simplest of sense, enzymes work on a “lock and key” basis (based on the model first postulated by the Emil Fischer.) The model takes the analogy that the lock is the enzyme and the substrate functions as the key. A substrate is a molecule acted on by an enzyme, hence, only the correctly sized substrate will fit in the keyhole (an analogy for the active site) of the lock (or the enzyme in this case).

Macromolecules Macromolecules are very large molecules, usually consisting of thousands of atoms or more. Proteins and lipids are macromolecules that are found in living organisms. Synthetic macromolecules include plastics and carbon nanotubes. According mammalian systems, there are three major types of macromolecules:

Carbohydrates	Proteins	Lipids	Nucleic
			Acids.

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{'question_number': 3, 'question': 'What are biomolecules?', 'right_answer': 'Biomolecules are carbon-based compounds found in or produced by organisms, and they are essential to a biological process. Examples include proteins, lipids, carbohydrates, and nucleic acids.'}]]

39. 1255 words

INPUT =

What Is Evolution? Evolution is the study of the different forms of life, its characteristics and the changes over several generations. It is the scientific theory used by biologists to study the genetic variation in a population. There are many theories about how life originated on the planet Earth. The theory of evolution is based on the idea that all

species are correlated and progressively vary with time. Darwin's Theory of Evolution Charles Robert Darwin, an English naturalist, geologist, and biologist, is well known for his theory of evolution and the process of natural selection. He gave the theory of evolution, which is known as 'Darwin's theory of natural selection', and also published a book on "Origin of Species by Natural Selection". The main features of Darwin's Theory are as follows,

All organisms reproduce and multiply enormously. No two individuals are alike. They are different from each other either in size, shape, behaviour, etc. Some traits are consistently passed on from their parent to the offspring. The rate of reproduction varies in all living species. Some reproduce more and some minimum. A Brief Account of Evolution According to several theories of evolution:

The first cellular forms of life appeared on Earth about 2000 million years ago. Later single-celled organisms, multicellular forms, and invertebrates were formed and became active. Jawless fish evolved, and different organisms started to invade from water to land. Later, amphibians and reptiles, some of them viviparous mammals, came into existence. About 23.03 to 5.333 million years ago, evolved primates that resembled today's gorillas and chimpanzees. During the ice age between 75,000-10,000 years ago, modern Homo sapiens arose. Evidence for Evolution It indicates the paleontological evidence, which denotes that life forms have arisen at various instances in the Earth's history, which covers fossils, rocks from sediments, etc. Ernst Haeckel proposed embryological support for evidence which was based upon the observation of some traits during the embryonic stages that persisted in all vertebrates that are not found in adults. The proposal was disapproved by Karl Ernst von Baer as he noted that embryos do not go through the adult phases of other animals. Divergent evolution is used to refer to the animals having the same structure developed along different directions as a result of adaptations to different needs. The structures are referred to as homologous, where homology represents common ancestry. Example – The tendrils and thorns of Cucurbita and Bougainvillea indicate homology. Convergent evolution refers to different structures evolving for the same function, thereby having similarities. This is why analogous structures are a result of convergent evolution. Examples of analogy – Flippers of Dolphins and Penguins. It was indicated that entities in a mixed population could adapt better, survive and cause an increase in the size of the population. But none of the variants got wiped out completely. Examples of evolution by anthropogenic action are the appearance of resistant cells/entities in a time span of months or years as opposed to centuries. Through this evidence, it was also indicated that evolution is not a directed process in the context of determinism; rather is a stochastic process basis the chance events in nature and chance mutations in entities. Adaptive Radiation It is referred to the process of evolution of various species in particular geographical regions right

from the point and radiating literally to other geographical areas. Examples are Australian marsupials and Darwin's finches. Entities are better adapted to survive in an otherwise hostile environment as the adaptive ability is inherited, it being a genetic basis, whereas fitness is the outcome of the ability to adapt and hence getting selected by nature. Two key concepts of the Darwinian theory of evolution are branching descent and natural selection.

Hardy-Weinberg Principle This principle states that allele frequencies in a population are stable and are constant from generation to generation; the gene pool remains constant. This is referred to as genetic equilibrium, where the sum total of all allelic frequencies is 1. In a diploid, let p and q represent the frequency of alleles A and a. The probability that an allele A with a frequency of p appears on both the chromosomes of a diploid individual is simply the product of the probabilities. Five factors affecting the Hardy-Weinberg principle are – gene flow, genetic drift, genetic recombination, mutation and natural selection. When the original drifted population becomes founders, the effect is known as the founder effect.

Organisms An organism refers to a contiguous living system that lives in an environment and has the ability to adapt and retain certain structures and behaviour. It includes fungi, bacteria, plants, animals, and humans. An organism collectively forms a population. The population forms a community which operates the ecosystem. The ecosystem consists of both biotic and abiotic factors. Major abiotic factors which lead to variation in the physical and chemical conditions of different habitats are temperature, water, light, and soil.

Organisms and Environment All organisms possess the ability to adapt to different environmental conditions due to genetic variations. This increases their chances of survival. The polar bear has different character traits that help them to adapt to the extremely cold climate of Antarctica. The dense fur coats protect them from cold and predators. The waxy coat repels water and keeps the body warm. These features help them to adapt to the cold.

Population The population is defined as a group of individuals or organisms of any species living in a well-defined geographical area at a specific time with the capability of interbreeding. For example, the population of deer in a forest.

Population Attributes

Birth rate – Total number of individuals born in a given period of time. **Death rates** – Total number of deaths in a period of time. **Sex Ratio** – Total number of females and males per 1000 individuals. **Age pyramid** – A plot of age distribution.

Population Growth Population growth refers to the increase in the number of individuals in a population. This depends on various factors such as weather, food availability, predator pressure, etc. The population density changes due to the following factors:

Natality: The number of births in a population in a given time period. **Mortality:** The number of deaths in a population in a given time period. **Emigration:** The number of individuals who moved to some other habitat in a certain time period. **Immigration:** The number

of individuals who have come into the habitat from elsewhere in a certain period of time.

Population Growth Models The population growth models include: Exponential

Growth: With the limited supply of food, the population follows exponential growth.

Logistic Growth: When the resources are finite and become limited sooner or later, population growth is said to be logistic. **Population Interactions** This refers to the

interaction between different populations. There are various modes of population interaction. These include: Predation This is a type of interaction in which an organism kills and feeds on another organism. The one who kills is known as the predator and the one who is killed is the prey. Competition This is the type of biological interaction

between different animals or species in which both are harmed. Parasitism Parasitism is a type of interaction between species in which the parasite lives inside the body of another organism and cause harm to it. Commensalism In this type of interaction, one organism

benefits while the other is neither benefitted nor harmed. Mutualism In this type of interaction, both the species or organisms are benefitted from each other."""

OUTPUT =

```
{'multiple_choice_questions': [
```

```
{'question_number': 1, 'question': 'Which scientist is well known for his theory of evolution and natural selection?', 'option1': 'Ernst Heckel', 'option2': 'Karl Ernst von Baer', 'option3': 'Charles Robert Darwin', 'option4': 'Hardy-Weinberg', 'right_answer_number': 3, 'right_answer': 'Charles Robert Darwin'},
```

```
{'question_number': 2, 'question': 'What is the theory of evolution based on?', 'option1': 'Different forms of life', 'option2': 'Genetic variation', 'option3': 'Extinction of species', 'option4': 'Natural selection', 'right_answer_number': 2, 'right_answer': 'Genetic variation'},
```

```
{'question_number': 3, 'question': 'What is the process of evolution of various species in different geographical regions called?', 'option1': 'Adaptive Radiation', 'option2': 'Hardy-Weinberg Principle', 'option3': 'Convergent evolution', 'option4': 'Divergent evolution', 'right_answer_number': 1, 'right_answer': 'Adaptive Radiation'},
```

```
{'question_number': 4, 'question': 'Which principle states that allele frequencies in a population remain constant from generation to generation?', 'option1': 'Adaptive Radiation', 'option2': 'Hardy-Weinberg Principle', 'option3': 'Convergent evolution',
```

'option4': 'Divergent evolution', 'right_answer_number': 2, 'right_answer': 'Hardy-Weinberg Principle'},

{'question_number': 5, 'question': 'What is the interaction in which one organism kills and feeds on another organism called?', 'option1': 'Predation', 'option2': 'Competition', 'option3': 'Parasitism', 'option4': 'Mutualism', 'right_answer_number': 1, 'right_answer': 'Predation'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'Who gave the theory of evolution?', 'right_answer': 'Charles Robert Darwin'},

{'question_number': 2, 'question': 'What is the study of the different forms of life and their characteristics called?', 'right_answer': 'Evolution'},

{'question_number': 3, 'question': 'What is the process of evolution of various species in particular geographical regions called?', 'right_answer': 'Adaptive Radiation'},

{'question_number': 4, 'question': 'What principle states that allele frequencies in a population remain constant from generation to generation?', 'right_answer': 'Hardy-Weinberg Principle'},

{'question_number': 5, 'question': 'What is the interaction in which one organism kills and feeds on another organism called?', 'right_answer': 'Predation'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': '_____ is the scientific theory used to study the genetic variation in a population.', 'right_answer': 'Evolution'},

{'question_number': 2, 'question': 'Charles Robert Darwin is well known for his theory of evolution and the process of _____ selection.', 'right_answer': 'Natural'},

{'question_number': 3, 'question': '_____ refers to the increase in the number of individuals in a population.', 'right_answer': 'Population growth'}],

'descriptive_type_questions': []}

5. MATHEMATICS (11 tests)

40. Category: Lines and Angles

OUTPUT =

```
{'multiple_choice_questions': [
```

```
{'question_number': 1, 'question': 'In a right triangle, the side opposite the right angle is called the:', 'option1': 'Hypotenuse', 'option2': 'Adjacent side', 'option3': 'Opposite side', 'option4': 'None of the above', 'right_answer_number': 3, 'right_answer': 'Opposite side', 'steps_to_solve': 'In a right triangle, the side opposite the right angle is called the opposite side.'}
```

```
{'question_number': 2, 'question': 'If two angles are supplementary, then the sum of their measures is:', 'option1': '90 degrees', 'option2': '180 degrees', 'option3': '270 degrees', 'option4': '360 degrees', 'right_answer_number': 2, 'right_answer': '180 degrees', 'steps_to_solve': 'If two angles are supplementary, their measures add up to 180 degrees.'},
```

```
{'question_number': 3, 'question': 'What is the sum of the interior angles of a triangle?', 'option1': '90 degrees', 'option2': '180 degrees', 'option3': '270 degrees', 'option4': '360 degrees', 'right_answer_number': 2, 'right_answer': '180 degrees', 'steps_to_solve': 'The sum of the interior angles of a triangle is always 180 degrees.'},
```

```
{'question_number': 4, 'question': 'What type of angle is formed when two lines are perpendicular to each other?', 'option1': 'Acute angle', 'option2': 'Right angle', 'option3': 'Obtuse angle', 'option4': 'Straight angle', 'right_answer_number': 2, 'right_answer': 'Right angle', 'steps_to_solve': 'When two lines are perpendicular to each other, a right angle is formed.'},
```

```
{'question_number': 5, 'question': 'What is the measure of an angle with a straight line?', 'option1': '90 degrees', 'option2': '180 degrees', 'option3': '270 degrees', 'option4': '360 degrees', 'right_answer_number': 2, 'right_answer': '180 degrees', 'steps_to_solve': 'An angle with a straight line measures 180 degrees.'}]
```


'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the name of an angle that measures less than 90 degrees?', 'right_answer': 'Acute angle', 'steps_to_solve': 'An angle that measures less than 90 degrees is called an acute angle.'},

{'question_number': 2, 'question': 'What is the name of an angle that measures exactly 90 degrees?', 'right_answer': 'Right angle', 'steps_to_solve': 'An angle that measures exactly 90 degrees is called a right angle.'},

{'question_number': 3, 'question': 'What is the name of an angle that measures more than 90 degrees and less than 180 degrees?', 'right_answer': 'Obtuse angle', 'steps_to_solve': 'An angle that measures more than 90 degrees and less than 180 degrees is called an obtuse angle.'},

{'question_number': 4, 'question': 'What is the name of an angle that measures exactly 180 degrees?', 'right_answer': 'Straight angle', 'steps_to_solve': 'An angle that measures exactly 180 degrees is called a straight angle.'},

{'question_number': 5, 'question': 'What is the name of an angle that measures more than 180 degrees and less than 360 degrees?', 'right_answer': 'Reflex angle', 'steps_to_solve': 'An angle that measures more than 180 degrees and less than 360 degrees is called a reflex angle.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The sum of the angles in a triangle is _____ degrees.', 'right_answer': '180', 'steps_to_solve': 'The sum of the angles in a triangle is always 180 degrees.'},

{'question_number': 2, 'question': 'A _____ angle measures exactly 180 degrees.', 'right_answer': 'straight', 'steps_to_solve': 'A straight angle measures exactly 180 degrees.'},

{'question_number': 3, 'question': 'An angle that measures more than 90 degrees and less than 180 degrees is called an _____ angle.', 'right_answer': 'obtuse',

'steps_to_solve': 'An angle that measures more than 90 degrees and less than 180 degrees is called an obtuse angle.'},

{'question_number': 4, 'question': 'An angle that measures exactly 90 degrees is called a _____ angle.', 'right_answer': 'right', 'steps_to_solve': 'An angle that measures exactly 90 degrees is called a right angle.'},

{'question_number': 5, 'question': 'An angle that measures more than 180 degrees and less than 360 degrees is called a _____ angle.', 'right_answer': 'reflex', 'steps_to_solve': 'An angle that measures more than 180 degrees and less than 360 degrees is called a reflex angle.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of complementary angles.', 'right_answer': 'Complementary angles are two angles whose sum is 90 degrees. In other words, when the measures of two angles add up to 90 degrees, they are called complementary angles. For example, if one angle measures 30 degrees, the other angle will measure 60 degrees to make a total of 90 degrees.', 'steps_to_solve': 'To understand complementary angles, it is important to know that the sum of angles in a triangle is 180 degrees.'},

{'question_number': 2, 'question': 'Describe the relationship between opposite angles in a parallelogram.', 'right_answer': 'Opposite angles in a parallelogram are congruent, which means they have the same measure. This means that if one angle measures 60 degrees, the opposite angle will also measure 60 degrees.', 'steps_to_solve': 'To understand opposite angles in a parallelogram, it is important to know the properties and characteristics of parallelograms.'},

{'question_number': 3, 'question': 'Explain the concept of vertical angles.', 'right_answer': 'Vertical angles are two non-adjacent angles formed by the intersection of two lines. They are congruent, which means they have the same measure. This means that if one angle measures 40 degrees, the vertical angle will also measure 40 degrees.', 'steps_to_solve': 'To understand vertical angles, it is important to know the properties and characteristics of intersecting lines.'},

{'question_number': 4, 'question': 'Explain the concept of adjacent angles.',
'right_answer': 'Adjacent angles are two angles that have a common side and a common vertex. The interior angles of a triangle are examples of adjacent angles. If one angle measures 30 degrees, the adjacent angle may measure 60 degrees.',
'steps_to_solve': 'To understand adjacent angles, it is important to know the properties and characteristics of angles and triangles.'},

{'question_number': 5, 'question': 'Explain the concept of supplementary angles.',
'right_answer': 'Supplementary angles are two angles whose sum is 180 degrees. In other words, when the measures of two angles add up to 180 degrees, they are called supplementary angles. For example, if one angle measures 90 degrees, the other angle will measure 90 degrees to make a total of 180 degrees.',
'steps_to_solve': 'To understand supplementary angles, it is important to know the sum of angles in a triangle is 180 degrees.'}}}

41. Category: Integers

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What is the sum of -7 and 3?', 'option1': '-4',
'option2': '10', 'option3': '0', 'option4': '-3', 'right_answer_number': 1,
'right_answer': '-4', 'steps_to_solve': 'Add -7 and 3 to get -4.'},

{'question_number': 2, 'question': 'Which integer is greater: -5 or -2?', 'option1':
'-5', 'option2': '-2', 'option3': 'Neither', 'option4': 'Both', 'right_answer_number': 2,
'right_answer': '-2', 'steps_to_solve': 'Compare -5 and -2. As -2 is greater than -5,
the answer is -2.'},

{'question_number': 3, 'question': 'What is the product of -8 and 2?', 'option1':
'-16', 'option2': '10', 'option3': '0', 'option4': '-6', 'right_answer_number': 1,
'right_answer': '-16', 'steps_to_solve': 'Multiply -8 and 2 to get -16.'},

{'question_number': 4, 'question': 'What is the result of subtracting 4 from -2?',
'option1': '2', 'option2': '-6', 'option3': '6', 'option4': '-2', 'right_answer_number': 2,
'right_answer': '-6', 'steps_to_solve': 'Subtract 4 from -2 to get -6.'},

{'question_number': 5, 'question': 'What is the absolute value of -9?', 'option1': '-9', 'option2': '9', 'option3': '0', 'option4': '-1', 'right_answer_number': 2, 'right_answer': '9', 'steps_to_solve': 'The absolute value of -9 is 9.'},

'single_word_answer_type_questions': [],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The opposite of -2 is ____', 'right_answer': '2', 'steps_to_solve': 'The opposite of a number is the number with the opposite sign. So, the opposite of -2 is 2.'},

{'question_number': 2, 'question': 'The sum of -3 and 7 is ____', 'right_answer': '4', 'steps_to_solve': 'Add -3 and 7 to get 4.'},

{'question_number': 3, 'question': 'The result of multiplying -5 and -6 is ____', 'right_answer': '30', 'steps_to_solve': 'Multiply -5 and -6 to get 30.'},

{'question_number': 4, 'question': 'The result of dividing -20 by 5 is ____', 'right_answer': '-4', 'steps_to_solve': 'Divide -20 by 5 to get -4.'},

{'question_number': 5, 'question': 'The opposite of 0 is ____', 'right_answer': '0', 'steps_to_solve': 'The opposite of 0 is still 0.'},

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of absolute value.', 'right_answer': 'The absolute value of a number is its distance from zero on the number line. It is always a non-negative value. For example, the absolute value of -5 is 5, and the absolute value of 7 is 7.', 'steps_to_solve': ""},

{'question_number': 2, 'question': 'Describe the process of subtracting integers with different signs.', 'right_answer': 'When subtracting integers with different signs, we change the operation to addition and keep the sign of the number with the larger absolute value. For example, to subtract -4 from 2, we change it to $2 + 4 = 6$.', 'steps_to_solve': ""},

```
{'question_number': 3, 'question': 'Explain the rule for multiplying integers with different signs.', 'right_answer': 'When multiplying integers with different signs, the product is always negative. For example, -3 multiplied by 5 is -15.', 'steps_to_solve': ''},
```

```
{'question_number': 4, 'question': 'Describe the concept of the opposite of an integer.', 'right_answer': 'The opposite of an integer is the number with the opposite sign. For example, the opposite of -2 is 2, and the opposite of 5 is -5.', 'steps_to_solve': ''},
```

```
{'question_number': 5, 'question': 'Explain the process of finding the sum of integers with different signs.', 'right_answer': 'When adding integers with different signs, we find the difference between their absolute values and keep the sign of the number with the larger absolute value. For example, to find the sum of -6 and 3, we subtract 3 from 6 and keep the negative sign, resulting in -3.', 'steps_to_solve': ''}}
```

42. Category: Trigonometry

OUTPUT =

```
{'multiple_choice_questions': [
```

```
{'question_number': 1, 'question': 'What is the value of sine(45 degrees)?', 'option1': '0.5', 'option2': '0.707', 'option3': '1', 'option4': '0.866', 'right_answer_number': 2, 'right_answer': '0.707', 'steps_to_solve': 'The value of sine(45 degrees) can be found by dividing the length of the side opposite the angle by the length of the hypotenuse of a right-angled triangle with a 45-degree angle.'},
```

```
{'question_number': 2, 'question': 'Which trigonometric ratio is equal to opposite/hypotenuse?', 'option1': 'Sine', 'option2': 'Cosine', 'option3': 'Tangent', 'option4': 'Cosecant', 'right_answer_number': 1, 'right_answer': 'Sine', 'steps_to_solve': 'The trigonometric ratio opposite/hypotenuse is known as the sine ratio.'},
```

{'question_number': 3, 'question': 'What is the value of tangent(30 degrees)?', 'option1': '0.5', 'option2': '0.866', 'option3': '1', 'option4': '1.732', 'right_answer_number': 4, 'right_answer': '1.732', 'steps_to_solve': 'The value of tangent(30 degrees) can be found by dividing the length of the side opposite the angle by the length of the side adjacent to the angle in a right-angled triangle.'},

{'question_number': 4, 'question': 'Which trigonometric ratio is equal to adjacent/hypotenuse?', 'option1': 'Cosine', 'option2': 'Secant', 'option3': 'Cosecant', 'option4': 'Tangent', 'right_answer_number': 1, 'right_answer': 'Cosine', 'steps_to_solve': 'The trigonometric ratio adjacent/hypotenuse is known as the cosine ratio.'},

{'question_number': 5, 'question': 'What is the value of cosine(60 degrees)?', 'option1': '0.5', 'option2': '0.866', 'option3': '1', 'option4': '0.707', 'right_answer_number': 3, 'right_answer': '1', 'steps_to_solve': 'The value of cosine(60 degrees) can be found by dividing the length of the side adjacent to the angle by the length of the hypotenuse of a right-angled triangle with a 60-degree angle.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the reciprocal of sine?', 'right_answer': 'Cosecant', 'steps_to_solve': 'The reciprocal of sine is cosecant.'},

{'question_number': 2, 'question': 'What is the reciprocal of cosine?', 'right_answer': 'Secant', 'steps_to_solve': 'The reciprocal of cosine is secant.'},

{'question_number': 3, 'question': 'What is the reciprocal of tangent?', 'right_answer': 'Cotangent', 'steps_to_solve': 'The reciprocal of tangent is cotangent.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The Pythagorean identity states that $\sin^2(x) + \cos^2(x) = 1$.', 'right_answer': ' $\cos^2(x)$ ', 'steps_to_solve': 'The Pythagorean identity states that $\sin^2(x) + \cos^2(x) = 1$.'},

{'question_number': 2, 'question': 'The trigonometric ratio $\tan(x)$ is equal to ____.',
'right_answer': ' $\sin(x) / \cos(x)$ ', 'steps_to_solve': 'The trigonometric ratio $\tan(x)$ is equal to $\sin(x) / \cos(x)$.'},

{'question_number': 3, 'question': 'The value of $\sin(0 \text{ degrees})$ is ____.',
'right_answer': '0', 'steps_to_solve': 'The value of $\sin(0 \text{ degrees})$ is 0.'},

{'question_number': 4, 'question': 'The value of $\cos(90 \text{ degrees})$ is ____.',
'right_answer': '0', 'steps_to_solve': 'The value of $\cos(90 \text{ degrees})$ is 0.'},

{'question_number': 5, 'question': 'The value of $\tan(45 \text{ degrees})$ is ____.',
'right_answer': '1', 'steps_to_solve': 'The value of $\tan(45 \text{ degrees})$ is 1.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of trigonometry.',
'right_answer': 'Trigonometry is a branch of mathematics that deals with the relationships between the angles and sides of triangles. It involves the study of sine, cosine, tangent, and their reciprocal functions, as well as the Pythagorean identity and various trigonometric identities and formulas.', 'steps_to_solve': 'This is a descriptive question and does not require any steps to solve.'},

{'question_number': 2, 'question': 'Describe the unit circle and its significance in trigonometry.', 'right_answer': 'The unit circle is a circle with a radius of 1 unit, centered at the origin of a coordinate plane. It is used in trigonometry to define the values of sine, cosine, and tangent for any angle. The x-coordinate of a point on the unit circle represents the cosine of the angle, and the y-coordinate represents the sine of the angle. The unit circle allows for easy calculation of trigonometric values and visualization of their relationships.', 'steps_to_solve': 'This is a descriptive question and does not require any steps to solve.'},

{'question_number': 3, 'question': 'Explain the concept of radians and their relationship with degrees.', 'right_answer': 'Radians are a unit of measurement for angles, similar to degrees. However, while degrees divide a circle into 360 equal parts, radians divide a circle into 2π (approximately 6.28) equal parts. The relationship between radians and degrees is given by the formula $\pi \text{ radians} = 180 \text{ degrees}$. Radians are often used in trigonometry because they simplify calculations

and are used in many trigonometric formulas and identities.', 'steps_to_solve': 'This is a descriptive question and does not require any steps to solve.'},

{'question_number': 4, 'question': 'Explain the concept of trigonometric ratios and their applications.', 'right_answer': 'Trigonometric ratios are ratios of the lengths of two sides of a right-angled triangle. The main trigonometric ratios are sine, cosine, and tangent, which represent the ratios of the lengths of the side opposite the angle, the side adjacent to the angle, and the side opposite divided by the side adjacent, respectively. Trigonometric ratios have applications in various fields, including physics, engineering, and navigation. They are used to solve problems involving angles and distances, such as finding the height of a building or the distance between two points.', 'steps_to_solve': 'This is a descriptive question and does not require any steps to solve.'},

{'question_number': 5, 'question': 'Discuss the relevance of trigonometry in real life.', 'right_answer': 'Trigonometry is used in a wide range of real-life applications, including architecture, engineering, physics, navigation, and astronomy. It is used to calculate distances and angles, solve problems involving right-angled triangles, analyze periodic phenomena such as waves and oscillations, design and construct buildings and structures, determine the positions of celestial objects, and much more. Trigonometry plays a crucial role in various scientific and practical fields, making it an essential branch of mathematics.', 'steps_to_solve': 'This is a descriptive question and does not require any steps to solve.'}}}

43. Category: Rational Numbers

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'Which of the following is a rational number?', 'option1': ' $\sqrt{2}$ ', 'option2': '0.25', 'option3': ' π ', 'option4': 'e', 'right_answer_number': 2, 'right_answer': '0.25', 'steps_to_solve': 'A rational number can be expressed as a fraction p/q , where p and q are integers and q is not equal to 0. Since 0.25 can be written as $25/100$ or $1/4$, it is a rational number.'},

{'question_number': 2, 'question': 'Which of the following is not a rational number?', 'option1': '0.75', 'option2': ' $\sqrt{5}$ ', 'option3': '-2', 'option4': ' $7/3$ ',

'right_answer_number': 2, 'right_answer': ' $\sqrt{5}$ ', 'steps_to_solve': 'A rational number can be expressed as a fraction p/q , where p and q are integers and q is not equal to 0. Since $\sqrt{5}$ is an irrational number and cannot be expressed as a fraction, it is not a rational number.'},

{'question_number': 3, 'question': 'Which of the following fractions is equivalent to $2/3$?', 'option1': ' $4/6$ ', 'option2': ' $3/2$ ', 'option3': ' $6/9$ ', 'option4': ' $2/6$ ', 'right_answer_number': 1, 'right_answer': ' $4/6$ ', 'steps_to_solve': 'To find an equivalent fraction, multiply both the numerator and denominator by the same non-zero number. In this case, multiply $2/3$ by $2/2$ to get $4/6$, which is equivalent to $2/3$.'},

{'question_number': 4, 'question': 'Which of the following is a proper fraction?', 'option1': ' $5/3$ ', 'option2': ' $3/2$ ', 'option3': ' $7/7$ ', 'option4': ' $4/5$ ', 'right_answer_number': 4, 'right_answer': ' $4/5$ ', 'steps_to_solve': 'A proper fraction is a fraction where the numerator is less than the denominator. In this case, $4/5$ is a proper fraction.'},

{'question_number': 5, 'question': 'Simplify the fraction $12/18$.', 'option1': ' $2/3$ ', 'option2': ' $3/2$ ', 'option3': ' $3/6$ ', 'option4': ' $4/5$ ', 'right_answer_number': 1, 'right_answer': ' $2/3$ ', 'steps_to_solve': 'To simplify a fraction, find the greatest common divisor (GCD) of the numerator and denominator and divide both by it. The GCD of 12 and 18 is 6. Divide both 12 and 18 by 6 to get $2/3$, which is the simplified form of $12/18$.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is a rational number?', 'right_answer': 'A rational number can be expressed as a fraction p/q , where p and q are integers and q is not equal to 0.', 'steps_to_solve': ""},

{'question_number': 2, 'question': 'Give an example of an irrational number.', 'right_answer': ' $\sqrt{2}$ ', 'steps_to_solve': ""},

{'question_number': 3, 'question': 'Define a proper fraction.', 'right_answer': 'A proper fraction is a fraction where the numerator is less than the denominator.', 'steps_to_solve': ""}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'Any number that can be written in the form of _____ is a rational number.', 'right_answer': 'a fraction p/q', 'steps_to_solve': ''},

{'question_number': 2, 'question': 'The square root of 5 is an _____ number.', 'right_answer': 'irrational', 'steps_to_solve': ''},

{'question_number': 3, 'question': 'A fraction where the numerator is _____ than the denominator is called a proper fraction.', 'right_answer': 'less', 'steps_to_solve': ''},

{'question_number': 4, 'question': 'A fraction where the numerator is _____ than the denominator is called an improper fraction.', 'right_answer': 'greater', 'steps_to_solve': ''},

{'question_number': 5, 'question': 'To simplify a fraction, find the greatest _____ divisor (GCD) of the numerator and denominator.', 'right_answer': 'common', 'steps_to_solve': ''}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of rational numbers with an example.', 'right_answer': 'A rational number can be expressed as a fraction p/q , where p and q are integers and q is not equal to 0. For example, 0.25 can be written as $25/100$ or $1/4$, which shows that it is a rational number.', 'steps_to_solve': ''},

{'question_number': 2, 'question': 'Discuss the difference between rational and irrational numbers.', 'right_answer': 'Rational numbers can be expressed as fractions, while irrational numbers cannot be expressed as fractions and have non-terminating decimal representations. For example, 0.75 is a rational number because it can be written as $3/4$, whereas $\sqrt{5}$ is an irrational number as it cannot be expressed as a fraction.', 'steps_to_solve': ''},

{'question_number': 3, 'question': 'Explain how to simplify a fraction.', 'right_answer': 'To simplify a fraction, find the greatest common divisor (GCD) of the numerator and denominator and divide both by it. For example, to simplify the fraction 12/18, find the GCD of 12 and 18, which is 6. Divide both 12 and 18 by 6 to get the simplified form, which is 2/3.', 'steps_to_solve': ''},

{'question_number': 4, 'question': 'Discuss the concept of proper and improper fractions.', 'right_answer': 'A proper fraction is a fraction where the numerator is less than the denominator, while an improper fraction is a fraction where the numerator is greater than or equal to the denominator. For example, 4/5 is a proper fraction because the numerator (4) is less than the denominator (5), while 5/4 is an improper fraction because the numerator (5) is greater than the denominator (4).', 'steps_to_solve': ''},

{'question_number': 5, 'question': 'Explain the difference between a rational number and an integer.', 'right_answer': 'A rational number can be expressed as a fraction p/q , where p and q are integers and q is not equal to 0. An integer, on the other hand, is a whole number that can be either positive, negative, or zero. While all integers are rational numbers, not all rational numbers are integers. For example, $2/3$ is a rational number but not an integer, while -2 is both a rational number and an integer.', 'steps_to_solve': ''}}}

44. Category: Square and Square Roots

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What is the square of 9?', 'option1': '45', 'option2': '81', 'option3': '64', 'option4': '100', 'right_answer_number': 2, 'right_answer': '81', 'steps_to_solve': 'To find the square of a number, we multiply the number by itself. So, $9 * 9 = 81$.'},

{'question_number': 2, 'question': 'What is the square root of 64?', 'option1': '4', 'option2': '8', 'option3': '16', 'option4': '32', 'right_answer_number': 1, 'right_answer': '4', 'steps_to_solve': 'To find the square root of a number, we find

the number that when multiplied by itself gives the original number. So, the square root of 64 is 8.'},

{'question_number': 3, 'question': 'What is the square root of 25?', 'option1': '5', 'option2': '10', 'option3': '15', 'option4': '20', 'right_answer_number': 1, 'right_answer': '5', 'steps_to_solve': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number. So, the square root of 25 is 5.'},

{'question_number': 4, 'question': 'What is the square of 16?', 'option1': '196', 'option2': '256', 'option3': '324', 'option4': '400', 'right_answer_number': 2, 'right_answer': '256', 'steps_to_solve': 'To find the square of a number, we multiply the number by itself. So, $16 * 16 = 256$.'},

{'question_number': 5, 'question': 'What is the square of 7?', 'option1': '49', 'option2': '56', 'option3': '63', 'option4': '70', 'right_answer_number': 1, 'right_answer': '49', 'steps_to_solve': 'To find the square of a number, we multiply the number by itself. So, $7 * 7 = 49$.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the square root of 36?', 'right_answer': '6', 'steps_to_solve': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number. So, the square root of 36 is 6.'},

{'question_number': 2, 'question': 'What is the square root of 81?', 'right_answer': '9', 'steps_to_solve': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number. So, the square root of 81 is 9.'},

{'question_number': 3, 'question': 'What is the square of 5?', 'right_answer': '25', 'steps_to_solve': 'To find the square of a number, we multiply the number by itself. So, $5 * 5 = 25$.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The _____ of a number is the number multiplied by itself.', 'right_answer': 'square', 'steps_to_solve': 'To find the square of a number, we multiply the number by itself.'},

{'question_number': 2, 'question': 'The _____ root of a number is the number that when multiplied by itself gives the original number.', 'right_answer': 'square', 'steps_to_solve': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number.'},

{'question_number': 3, 'question': 'To find the square root of a number, we find the number that when multiplied by _____ gives the original number.', 'right_answer': 'itself', 'steps_to_solve': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number.'},

{'question_number': 4, 'question': 'To find the square of a number, we multiply the number by _____.', 'right_answer': 'itself', 'steps_to_solve': 'To find the square of a number, we multiply the number by itself.'},

{'question_number': 5, 'question': 'The square root of 100 is _____.', 'right_answer': '10', 'steps_to_solve': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number. So, the square root of 100 is 10.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain how to find the square of a number.', 'right_answer': 'To find the square of a number, we multiply the number by itself. For example, to find the square of 9, we multiply 9 by 9 which gives us 81.', 'steps_to_solve': '1. Take the number.\n2. Multiply the number by itself.\n3. The result is the square of the number.'},

{'question_number': 2, 'question': 'Explain how to find the square root of a number.', 'right_answer': 'To find the square root of a number, we find the number that when multiplied by itself gives the original number. For example, to find the square root of 25, we find the number that when multiplied by itself gives us 25,

which is 5.', 'steps_to_solve': '1. Take the number.\n2. Find the number that when multiplied by itself gives the original number.\n3. The result is the square root of the number.'},

{'question_number': 3, 'question': 'What is the relationship between the square and square root of a number?', 'right_answer': 'The square and square root of a number are inverse operations. The square of a number gives the result of multiplying the number by itself, while the square root of a number gives the result of finding the number that when multiplied by itself gives the original number.', 'steps_to_solve': '-'},

{'question_number': 4, 'question': 'How can we determine if a number is a perfect square?', 'right_answer': 'A number is a perfect square if its square root is an integer.', 'steps_to_solve': '-'}, {'question_number': 5, 'question': 'Explain the concept of square and square root using an example.', 'right_answer': "Let's say we have a number 9. The square of 9 is 81 because when we multiply 9 by itself, we get 81. The square root of 81 is 9 because 9 multiplied by itself gives 81. So, the square and square root of a number are related to each other.", 'steps_to_solve': '-'}}}

45. Category: Circles

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What is the formula to find the circumference of a circle?', 'option1': ' $C = 2\pi r$ ', 'option2': ' $C = \pi d$ ', 'option3': ' $C = \pi r^2$ ', 'option4': ' $C = 2\pi d$ ', 'right_answer_number': 2, 'right_answer': ' $C = \pi d$ ', 'steps_to_solve': 'To find the circumference of a circle, you can use the formula $C = \pi d$, where C represents the circumference and d represents the diameter of the circle.'},

{'question_number': 2, 'question': 'What is the formula to find the area of a circle?', 'option1': ' $A = \pi r$ ', 'option2': ' $A = \pi r^2$ ', 'option3': ' $A = 2\pi r$ ', 'option4': ' $A = \pi d$ ', 'right_answer_number': 2, 'right_answer': ' $A = \pi r^2$ ', 'steps_to_solve': 'To find the area of a circle, you can use the formula $A = \pi r^2$, where A represents the area and r represents the radius of the circle.'},

{'question_number': 3, 'question': 'What is the relationship between the diameter and the radius of a circle?', 'option1': 'The diameter is equal to twice the radius', 'option2': 'The diameter is equal to half the radius', 'option3': 'The diameter is equal to the radius squared', 'option4': 'The diameter is equal to the circumference', 'right_answer_number': 1, 'right_answer': 'The diameter is equal to twice the radius', 'steps_to_solve': 'The diameter of a circle is equal to twice the radius. In other words, if you know the radius of a circle, you can find the diameter by multiplying the radius by 2.'},

{'question_number': 4, 'question': 'Which of the following is a property of circles?', 'option1': 'All radii are equal in length', 'option2': 'The sum of the angles in a circle is equal to 180 degrees', 'option3': 'The area of a circle is equal to the circumference', 'option4': 'Circles have straight sides', 'right_answer_number': 1, 'right_answer': 'All radii are equal in length', 'steps_to_solve': 'One of the properties of circles is that all radii (plural for radius) are equal in length. The radius is the distance from the center of the circle to any point on its circumference.'},

{'question_number': 5, 'question': 'What is the ratio of the circumference of a circle to its diameter?', 'option1': ' π ', 'option2': ' 2π ', 'option3': ' $\pi/2$ ', 'option4': ' 3π ', 'right_answer_number': 1, 'right_answer': ' π ', 'steps_to_solve': 'The ratio of the circumference of a circle to its diameter is always π (pi), which is approximately equal to 3.14159.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the measurement of the radius of a circle with a diameter of 8 units?', 'right_answer': '4', 'steps_to_solve': 'To find the radius of a circle, you can divide the diameter by 2. In this case, the diameter is 8 units, so the radius would be $8 / 2 = 4$ units.'},

{'question_number': 2, 'question': 'What is the measurement of the diameter of a circle with a circumference of 12π units?', 'right_answer': '12', 'steps_to_solve': 'To find the diameter of a circle, you can divide the circumference by π (pi). In this case, the circumference is 12π units, so the diameter would be 12 units.'},

{'question_number': 3, 'question': 'What is the measurement of the radius of a circle with an area of 25π square units?', 'right_answer': '5', 'steps_to_solve': 'To find the radius of a circle given its area, you can use the formula $A = \pi r^2$, where A represents the area and r represents the radius. In this case, the area is 25π square units, so the radius would be the square root of $(25\pi / \pi) = 5$ units.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The _____ of a circle is a line segment that connects any two points on the circle and passes through the center.', 'right_answer': 'diameter', 'steps_to_solve': 'The diameter of a circle is a line segment that connects any two points on the circle and passes through the center.'},

{'question_number': 2, 'question': 'The _____ is the distance from the center of a circle to any point on its circumference.', 'right_answer': 'radius', 'steps_to_solve': 'The radius of a circle is the distance from the center of the circle to any point on its circumference.'},

{'question_number': 3, 'question': 'The _____ is a measure of the amount of space inside a circle.', 'right_answer': 'area', 'steps_to_solve': 'The area of a circle is a measure of the amount of space inside the circle.'},

{'question_number': 4, 'question': 'The _____ is the distance around the circle.', 'right_answer': 'circumference', 'steps_to_solve': 'The circumference of a circle is the distance around the circle.'},

{'question_number': 5, 'question': 'The _____ constants in a circle is π (pi), which is approximately equal to 3.14159.', 'right_answer': 'irrational', 'steps_to_solve': 'The value of π (pi) is an irrational constant in a circle, meaning it cannot be expressed exactly as a simple fraction or decimal.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain how to find the circumference of a circle and give an example.', 'right_answer': 'To find the circumference of a circle, you can use the formula $C = \pi d$, where C represents the circumference and d

represents the diameter of the circle. For example, if the diameter of a circle is 10 units, the circumference would be $C = \pi * 10 = 31.4159$ units.', 'steps_to_solve': "},

{'question_number': 2, 'question': 'Explain how to find the area of a circle and give an example.', 'right_answer': 'To find the area of a circle, you can use the formula $A = \pi r^2$, where A represents the area and r represents the radius of the circle. For example, if the radius of a circle is 5 units, the area would be $A = \pi * 5^2 = 78.5398$ square units.', 'steps_to_solve': "},

{'question_number': 3, 'question': 'Discuss the properties of circles and provide examples.', 'right_answer': 'Circles have several properties that distinguish them. One property is that all radii (plural for radius) of a circle are equal in length. For example, if a circle has a radius of 3 units, any other radius drawn in the circle would also measure 3 units. Another property is that the sum of the angles in a circle is equal to 360 degrees. This means that if you were to measure the angles formed by drawing radii from the center of a circle to its circumference, the sum of those angles would always add up to 360 degrees.', 'steps_to_solve': "},

{'question_number': 4, 'question': 'Explain the relationship between the diameter and the radius of a circle.', 'right_answer': 'The diameter of a circle is equal to twice the radius. In other words, if you know the radius of a circle, you can find the diameter by multiplying the radius by 2. For example, if the radius of a circle is 6 units, the diameter would be $2 * 6 = 12$ units.', 'steps_to_solve': "},

{'question_number': 5, 'question': 'Describe the ratio of the circumference of a circle to its diameter.', 'right_answer': 'The ratio of the circumference of a circle to its diameter is always π (pi), which is approximately equal to 3.14159. This means that if you divide the circumference of any circle by its diameter, you will get a value close to π . For example, if the circumference of a circle is 20 units and the diameter is 10 units, the ratio would be $20 / 10 = 2$, which is close to π .', 'steps_to_solve': "}}}

46. Category: Surface Area and Volumes

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What is the formula to find the surface area of a rectangular prism?', 'option1': '2lw + 2lh + 2wh', 'option2': '2lw + lh + wh', 'option3': 'lw + lh + wh', 'option4': 'lw + lh', 'right_answer_number': 1, 'right_answer': '2lw + 2lh + 2wh', 'steps_to_solve': 'Calculate the area of each face and sum them up.'},

{'question_number': 2, 'question': 'What is the formula to find the lateral surface area of a cylinder?', 'option1': '2 π rh', 'option2': ' πr^2 ', 'option3': '2 πr ', 'option4': ' $\pi r^2 + 2\pi rh$ ', 'right_answer_number': 4, 'right_answer': ' $\pi r^2 + 2\pi rh$ ', 'steps_to_solve': 'Calculate the area of the two bases and the curved surface area and sum them up.'},

{'question_number': 3, 'question': 'What is the formula to find the volume of a cone?', 'option1': ' $\pi r^2 h$ ', 'option2': ' $1/3 \pi r^2 h$ ', 'option3': ' $1/2 \pi r^2 h$ ', 'option4': ' $2/3 \pi r^2 h$ ', 'right_answer_number': 2, 'right_answer': ' $1/3 \pi r^2 h$ ', 'steps_to_solve': 'Calculate the area of the base multiplied by the height and divide by 3.'},

{'question_number': 4, 'question': 'What is the formula to find the total surface area of a sphere?', 'option1': '4 πr^2 ', 'option2': ' πr^2 ', 'option3': '2 πrh ', 'option4': ' πd ', 'right_answer_number': 1, 'right_answer': '4 πr^2 ', 'steps_to_solve': 'Calculate the area of the curved surface.'},

{'question_number': 5, 'question': 'What is the formula to find the volume of a rectangular prism?', 'option1': 'lw + lh + wh', 'option2': 'lwh', 'option3': '2lw + lh + wh', 'option4': '2lw + 2lh + 2wh', 'right_answer_number': 2, 'right_answer': 'lwh', 'steps_to_solve': 'Calculate the product of length, width, and height.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the formula to find the volume of a pyramid?', 'right_answer': ' $1/3 Bh$ ', 'steps_to_solve': 'Calculate the area of the base multiplied by the height and divide by 3.'},

{'question_number': 2, 'question': 'What is the formula to find the volume of a cylinder?', 'right_answer': ' $\pi r^2 h$ ', 'steps_to_solve': 'Calculate the area of the base multiplied by the height.'}, {'question_number': 3, 'question': 'What is the formula

to find the volume of a sphere?', 'right_answer': ' $\frac{4}{3} \pi r^3$ ', 'steps_to_solve': 'Calculate the volume using the radius cubed and the constant $\frac{4}{3}$ multiplied by π .'},

'fill_in_the_blank_type_questions': [

{ 'question_number': 1, 'question': 'The surface area of a cube is _____.', 'right_answer': ' $6s^2$ ', 'steps_to_solve': 'Calculate the area of each face and sum them up.' },

{ 'question_number': 2, 'question': 'The volume of a cylinder is _____.', 'right_answer': ' $\pi r^2 h$ ', 'steps_to_solve': 'Calculate the area of the base multiplied by the height.' },

{ 'question_number': 3, 'question': 'The surface area of a cone is _____.', 'right_answer': ' $\pi r(r + l)$ ', 'steps_to_solve': 'Calculate the area of the base and the lateral surface area and sum them up.' },

{ 'question_number': 4, 'question': 'The volume of a sphere is _____.', 'right_answer': ' $\frac{4}{3} \pi r^3$ ', 'steps_to_solve': 'Calculate the volume using the radius cubed and the constant $\frac{4}{3}$ multiplied by π .'},

{ 'question_number': 5, 'question': 'The surface area of a rectangular prism is _____.', 'right_answer': ' $2lw + 2lh + 2wh$ ', 'steps_to_solve': 'Calculate the area of each face and sum them up.' }],

'descriptive_type_questions': [

{ 'question_number': 1, 'question': 'Explain how to find the volume of a pyramid.', 'right_answer': 'To find the volume of a pyramid, you need to calculate the area of the base and then multiply it by the height. Finally, divide the result by 3.', 'steps_to_solve': "" },

{ 'question_number': 2, 'question': 'Describe the steps to find the surface area of a cylinder.', 'right_answer': 'To find the surface area of a cylinder, first, calculate the area of the two bases by multiplying π times the square of the radius. Then, calculate the lateral surface area by multiplying the circumference of the base by

the height. Finally, sum the area of the two bases with the lateral surface area to get the total surface area.', 'steps_to_solve': "},

{'question_number': 3, 'question': 'Explain how to find the volume of a sphere.', 'right_answer': 'To find the volume of a sphere, use the formula $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius. First, cube the radius. Then, multiply the cubed radius by $\frac{4}{3}$ times π to find the volume.', 'steps_to_solve': "},

{'question_number': 4, 'question': 'Describe the process to find the surface area of a cone.', 'right_answer': 'To find the surface area of a cone, you need to calculate the area of the base and the lateral surface area. The area of the base can be found by using the formula $A = \pi r^2$. The lateral surface area can be found by multiplying the circumference of the base by the slant height of the cone. Finally, sum the area of the base and the lateral surface area to get the total surface area.', 'steps_to_solve': "},

{'question_number': 5, 'question': 'Explain how to find the volume of a rectangular prism.', 'right_answer': 'To find the volume of a rectangular prism, you need to multiply the length, width, and height of the prism. The formula to calculate the volume is $V = lwh$, where V is the volume, l is the length, w is the width, and h is the height.', 'steps_to_solve': "}}]

47. Category: Arithmetic Progression

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What is the common difference in an arithmetic progression?', 'option1': '1', 'option2': '2', 'option3': '3', 'option4': '4', 'right_answer_number': 2, 'right_answer': '2', 'steps_to_solve': 'The common difference in an arithmetic progression is obtained by subtracting any term from its previous term.'},

{'question_number': 2, 'question': 'In an arithmetic sequence, if the first term is 3 and the common difference is 4, what is the 5th term?', 'option1': '7', 'option2': '11', 'option3': '15', 'option4': '19', 'right_answer_number': 4, 'right_answer': '19',

'steps_to_solve': 'The nth term of an arithmetic sequence can be found using the formula: $\text{nth term} = \text{first term} + (n-1) * \text{common difference}$.'},

{'question_number': 3, 'question': 'What is the formula to find the sum of an arithmetic progression?', 'option1': ' $S = (n/2)(2a + (n-1)d)$ ', 'option2': ' $S = n(a + l)/2$ ', 'option3': ' $S = n(a + d)$ ', 'option4': ' $S = (n/2)(a + l)$ ', 'right_answer_number': 1, 'right_answer': ' $S = (n/2)(2a + (n-1)d)$ ', 'steps_to_solve': 'The formula to find the sum of an arithmetic progression is $S = (n/2)(2a + (n-1)d)$, where S is the sum, n is the number of terms, a is the first term, and d is the common difference.'},

{'question_number': 4, 'question': 'If the sum of an arithmetic progression is 45 and the number of terms is 9, what is the common difference?', 'option1': '3', 'option2': '4', 'option3': '5', 'option4': '6', 'right_answer_number': 1, 'right_answer': '3', 'steps_to_solve': 'We can use the formula for the sum of an arithmetic progression to find the common difference. Rearranging the formula, we have: $d = (S - (n/2)(2a + (n-1)d)) / (n-1)$. Plugging in the given values, we can solve for d.'},

{'question_number': 5, 'question': 'In an arithmetic sequence, if the first term is 9 and the common difference is -2, what is the 7th term?', 'option1': '3', 'option2': '5', 'option3': '7', 'option4': '9', 'right_answer_number': 2, 'right_answer': '5', 'steps_to_solve': 'Using the formula for the nth term of an arithmetic sequence: $\text{nth term} = \text{first term} + (n-1) * \text{common difference}$, we can calculate the 7th term by plugging in the given values.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the nth term formula for an arithmetic progression?', 'right_answer': ' $\text{nth term} = \text{first term} + (n-1) * \text{common difference}$ ', 'steps_to_solve': 'The nth term of an arithmetic progression can be found using the formula $\text{nth term} = \text{first term} + (n-1) * \text{common difference}$, where n is the term number.'},

{'question_number': 2, 'question': 'What is the formula to find the number of terms in an arithmetic progression?', 'right_answer': ' $n = (\text{last term} - \text{first term}) / \text{common difference} + 1$ ', 'steps_to_solve': 'To find the number of terms in an arithmetic progression, we can use the formula $n = (\text{last term} - \text{first term}) / \text{common difference} + 1$, where n is the number of terms, first term is the first term of the

progression, last term is the last term of the progression, and common difference is the difference between consecutive terms.'}],

{'question_number': 3, 'question': 'What is the formula to find the common difference in an arithmetic progression?', 'right_answer': 'common difference = (nth term - first term) / (n-1)', 'steps_to_solve': 'To find the common difference in an arithmetic progression, we can use the formula common difference = (nth term - first term) / (n-1), where common difference is the difference between consecutive terms, nth term is the term number, and first term is the first term of the progression.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'An arithmetic progression is a sequence of numbers in which the difference between _____ terms is constant.', 'right_answer': 'consecutive', 'steps_to_solve': 'In an arithmetic progression, the difference between consecutive terms is constant.'},

{'question_number': 2, 'question': 'The nth term of an arithmetic progression can be found using the formula nth term = _____ + (n-1) * common difference.', 'right_answer': 'first term', 'steps_to_solve': 'To find the nth term of an arithmetic progression, we use the formula nth term = first term + (n-1) * common difference, where first term is the value of the first term in the progression and common difference is the difference between consecutive terms.'},

{'question_number': 3, 'question': 'The sum of an arithmetic progression is given by the formula $S = \frac{n}{2}(2a + (n-1)d)$.', 'right_answer': ' $(n/2)(2a + (n-1)d)$ ', 'steps_to_solve': 'The sum of an arithmetic progression can be found using the formula $S = (n/2)(2a + (n-1)d)$, where S is the sum, n is the number of terms, a is the first term, and d is the common difference.'},

{'question_number': 4, 'question': 'The common difference in an arithmetic progression is obtained by subtracting any term from its _____ term.', 'right_answer': 'previous', 'steps_to_solve': 'To find the common difference in an arithmetic progression, subtract any term from its previous term.'},

{'question_number': 5, 'question': 'The formula to find the number of terms in an arithmetic progression is _____.', 'right_answer': ' $n = (\text{last term} - \text{first term}) / \text{common difference} + 1$ ', 'steps_to_solve': 'To find the number of terms in an arithmetic progression, use the formula $n = (\text{last term} - \text{first term}) / \text{common difference} + 1$, where n is the number of terms, first term is the first term of the progression, last term is the last term of the progression, and common difference is the difference between consecutive terms.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of an arithmetic progression.', 'right_answer': 'An arithmetic progression is a sequence of numbers in which the difference between consecutive terms is constant. This difference is called the common difference. It can be positive, negative, or zero. The terms of an arithmetic progression are obtained by adding the common difference to the previous term. The n th term of an arithmetic progression can be found using the formula $n\text{th term} = \text{first term} + (n-1) * \text{common difference}$. The sum of an arithmetic progression can be calculated using the formula $S = (n/2)(2a + (n-1)d)$, where S is the sum, n is the number of terms, a is the first term, and d is the common difference.', 'steps_to_solve': ""},

{'question_number': 2, 'question': 'Discuss the importance of arithmetic progressions in mathematics and everyday life.', 'right_answer': 'Arithmetic progressions are important in mathematics as they provide a foundation for the study of sequences and series. They are widely used in various mathematical concepts and applications, such as finding the missing term in a sequence, calculating the sum of a series, and solving problems related to linear equations. In everyday life, arithmetic progressions can be observed in various situations, such as the changing temperature over time, the increase or decrease in the balance of a bank account over months, and the progression of ages in a family. Understanding arithmetic progressions helps in analyzing and predicting patterns and trends in different contexts.', 'steps_to_solve': ""},

{'question_number': 3, 'question': 'Explain the formula to find the sum of an arithmetic progression.', 'right_answer': 'The formula to find the sum of an arithmetic progression is $S = (n/2)(2a + (n-1)d)$, where S is the sum, n is the number of terms, a is the first term, and d is the common difference. This formula

can be derived by using the concept of averages. The sum of the first and last term of an arithmetic progression is equal to the sum of the second and second-to-last term, and so on. By pairing the terms and finding their average, we can obtain the sum of the progression as the product of the average and the number of pairs. The average can be expressed in terms of the first term, last term, and common difference, resulting in the formula $S = (n/2)(a + l)$, where l is the last term. Rearranging this formula gives the more commonly used form.', 'steps_to_solve': "},

{'question_number': 4, 'question': 'Illustrate with an example the concept of a common difference in an arithmetic progression.', 'right_answer': 'Consider the arithmetic progression: 3, 7, 11, 15, 19. In this progression, the common difference is 4. To find the common difference, subtract any term from its previous term. For example, subtracting the second term (7) from the first term (3) gives a difference of 4. Similarly, subtracting the third term (11) from the second term (7) also gives a difference of 4. This pattern continues for the remaining terms. Therefore, the common difference in this arithmetic progression is 4.', 'steps_to_solve': "},

{'question_number': 5, 'question': 'Explain how to find the nth term of an arithmetic progression.', 'right_answer': 'To find the nth term of an arithmetic progression, use the formula nth term = first term + (n-1) * common difference. The first term is the value of the first term in the progression, and the common difference is the difference between consecutive terms. To obtain the nth term, multiply the common difference by (n-1) and add it to the first term. For example, in the arithmetic progression 2, 5, 8, 11, the common difference is 3. To find the 5th term, we can use the formula nth term = 2 + (5-1) * 3, which simplifies to nth term = 2 + 12 = 14. Therefore, the 5th term of this arithmetic progression is 14.', 'steps_to_solve': "}}}

48. Category: Cubes and Cube Roots

OUTPUT =

{'multiple_choice_questions': [

{'question_number': 1, 'question': 'What is the cube root of 27?', 'option1': '3', 'option2': '6', 'option3': '9', 'option4': '12', 'right_answer_number': 1, 'right_answer':

'3', 'steps_to_solve': 'The cube root of a number is a value that, when multiplied by itself three times, gives the original number. So, the cube root of 27 is 3.'},

{'question_number': 2, 'question': 'Which of the following numbers is a perfect cube?', 'option1': '16', 'option2': '27', 'option3': '32', 'option4': '36', 'right_answer_number': 2, 'right_answer': '27', 'steps_to_solve': 'A perfect cube is a number that can be expressed as the cube of an integer. Among the given options, 27 is a perfect cube because it is equal to 3^3 .'},

{'question_number': 3, 'question': 'What is the value of 6 cubed?', 'option1': '36', 'option2': '216', 'option3': '666', 'option4': '36,000', 'right_answer_number': 2, 'right_answer': '216', 'steps_to_solve': 'To find the cube of a number, we multiply the number by itself two more times. So, 6 cubed is equal to $6 * 6 * 6 = 216$.'},

{'question_number': 4, 'question': 'Which of the following is not a cube number?', 'option1': '8', 'option2': '64', 'option3': '125', 'option4': '216', 'right_answer_number': 1, 'right_answer': '8', 'steps_to_solve': 'A cube number is a number that can be expressed as the cube of an integer. Among the given options, 8 is not a cube number because it cannot be expressed as the cube of an integer.'},

{'question_number': 5, 'question': 'What is the cube of 5?', 'option1': '25', 'option2': '125', 'option3': '225', 'option4': '625', 'right_answer_number': 2, 'right_answer': '125', 'steps_to_solve': 'To find the cube of a number, we multiply the number by itself two more times. So, the cube of 5 is $5 * 5 * 5 = 125$.'}},

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the cube root of 64?', 'right_answer': '4', 'steps_to_solve': 'The cube root of a number is a value that, when multiplied by itself three times, gives the original number. So, the cube root of 64 is 4.'},

{'question_number': 2, 'question': 'What number should be multiplied by itself three times to give 125?', 'right_answer': '5', 'steps_to_solve': 'To find the cube root of a number, we need to find the number that, when multiplied by itself three times, gives the original number. In this case, the cube root of 125 is 5.'},

{'question_number': 3, 'question': 'Find the cube of 7.', 'right_answer': '343', 'steps_to_solve': 'To find the cube of a number, we multiply the number by itself two more times. So, the cube of 7 is $7 * 7 * 7 = 343$.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The cube root of 8 is _____.', 'right_answer': '2', 'steps_to_solve': 'The cube root of a number is a value that, when multiplied by itself three times, gives the original number. So, the cube root of 8 is 2.'},

{'question_number': 2, 'question': 'The value of 2 cubed is _____.', 'right_answer': '8', 'steps_to_solve': 'To find the cube of a number, we multiply the number by itself two more times. So, 2 cubed is equal to $2 * 2 * 2 = 8$.'},

{'question_number': 3, 'question': 'A perfect cube is a number that can be expressed as the cube of an _____.', 'right_answer': 'integer', 'steps_to_solve': 'A perfect cube is a number that can be expressed as the cube of an integer. For example, 27 is a perfect cube because it is equal to 3^3 .'},

{'question_number': 4, 'question': 'The cube root of 216 is _____.', 'right_answer': '6', 'steps_to_solve': 'The cube root of a number is a value that, when multiplied by itself three times, gives the original number. So, the cube root of 216 is 6.'},

{'question_number': 5, 'question': 'If a number is a perfect cube, it is always an _____.', 'right_answer': 'integer', 'steps_to_solve': 'If a number is a perfect cube, it is always an integer. This is because the cube of an integer will always result in an integer.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain what a cube number is and provide an example.', 'right_answer': 'A cube number is a number that can be expressed as the cube of an integer. This means that it is the result of multiplying an integer by itself twice. For example, 8 is a cube number because it can be expressed as 2^3 .', 'steps_to_solve': 'A cube number is a number that can be expressed as the cube of

an integer. This means that it is the result of multiplying an integer by itself twice. For example, 8 is a cube number because it can be expressed as 2^3 .'},

{'question_number': 2, 'question': 'Explain the concept of cube roots and provide an example.', 'right_answer': 'Cube roots are the opposite of cubing a number. They are values that, when multiplied by themselves three times, give the original number. For example, the cube root of 64 is 4 because $4 * 4 * 4 = 64$.', 'steps_to_solve': 'Cube roots are the opposite of cubing a number. They are values that, when multiplied by themselves three times, give the original number. For example, the cube root of 64 is 4 because $4 * 4 * 4 = 64$.'},

{'question_number': 3, 'question': 'Discuss the properties of cube numbers.', 'right_answer': 'Cube numbers have several properties:\n1. They are always positive, zero, or negative.\n2. The sum of two cube numbers is a cube number.\n3. The difference of two cube numbers is not always a cube number.\n4. The product of two cube numbers is a cube number.', 'steps_to_solve': 'Cube numbers have several properties:\n1. They are always positive, zero, or negative.\n2. The sum of two cube numbers is a cube number.\n3. The difference of two cube numbers is not always a cube number.\n4. The product of two cube numbers is a cube number.'},

{'question_number': 4, 'question': 'Explain the process of finding the cube of a number.', 'right_answer': 'To find the cube of a number, we multiply the number by itself two more times. This can be written as $\text{number} * \text{number} * \text{number}$. For example, to find the cube of 5, we multiply $5 * 5 * 5$, which equals 125.', 'steps_to_solve': 'To find the cube of a number, we multiply the number by itself two more times. This can be written as $\text{number} * \text{number} * \text{number}$. For example, to find the cube of 5, we multiply $5 * 5 * 5$, which equals 125.'},

{'question_number': 5, 'question': 'Explain how to determine if a number is a perfect cube.', 'right_answer': 'To determine if a number is a perfect cube, we need to find if it can be expressed as the cube of an integer. This means finding the integer value that, when multiplied by itself twice, gives the original number. For example, 27 is a perfect cube because it can be expressed as 3^3 .', 'steps_to_solve': 'To determine if a number is a perfect cube, we need to find if it can be expressed as the cube of an integer. This means finding the integer value that, when

multiplied by itself twice, gives the original number. For example, 27 is a perfect cube because it can be expressed as 3^3 .'}}]

49. Category: Exponents and Powers

OUTPUT =

```
{'multiple_choice_questions': [
```

```
{'question_number': 1, 'question': 'What is the value of  $2^3$ ?', 'option1': '2',  
'option2': '4', 'option3': '6', 'option4': '8', 'right_answer_number': 4, 'right_answer':  
'8', 'steps_to_solve': 'To find the value of  $2^3$ , you need to multiply 2 by itself 3  
times:  $2 * 2 * 2 = 8$ .'},
```

```
{'question_number': 2, 'question': 'What is the value of  $5^2$ ?', 'option1': '10',  
'option2': '15', 'option3': '20', 'option4': '25', 'right_answer_number': 4,  
'right_answer': '25', 'steps_to_solve': 'To find the value of  $5^2$ , you need to  
multiply 5 by itself 2 times:  $5 * 5 = 25$ .'},
```

```
{'question_number': 3, 'question': 'What is the value of  $10^0$ ?', 'option1': '0',  
'option2': '1', 'option3': '10', 'option4': '100', 'right_answer_number': 2,  
'right_answer': '1', 'steps_to_solve': 'Any number raised to the power of 0 is always  
equal to 1.'},
```

```
{'question_number': 4, 'question': 'What is the value of  $2^{-3}$ ?', 'option1': '-2',  
'option2': '-3', 'option3': '1/2', 'option4': '1/8', 'right_answer_number': 4,  
'right_answer': '1/8', 'steps_to_solve': 'To find the value of a negative exponent,  
you can rewrite it as the reciprocal of the positive exponent. So,  $2^{-3} = 1 / 2^3 =$   
 $1 / 8$ .'},
```

```
{'question_number': 5, 'question': 'What is the value of  $(-2)^2$ ?', 'option1': '-2',  
'option2': '2', 'option3': '-4', 'option4': '4', 'right_answer_number': 4, 'right_answer':  
'4', 'steps_to_solve': 'To find the value of  $(-2)^2$ , you need to multiply -2 by itself 2  
times:  $(-2) * (-2) = 4$ .'}],
```

'single_word_answer_type_questions': [

{ 'question_number': 1, 'question': 'What is 3^4 ?', 'right_answer': '81',
'steps_to_solve': 'To find the value of 3^4 , you need to multiply 3 by itself 4 times:
 $3 * 3 * 3 * 3 = 81$.'},

{ 'question_number': 2, 'question': 'Calculate 7^2 .', 'right_answer': '49',
'steps_to_solve': 'To find the value of 7^2 , you need to multiply 7 by itself 2 times:
 $7 * 7 = 49$.'},

{ 'question_number': 3, 'question': 'Evaluate 6^3 .', 'right_answer': '216',
'steps_to_solve': 'To find the value of 6^3 , you need to multiply 6 by itself 3 times:
 $6 * 6 * 6 = 216$.'}],

'fill_in_the_blank_type_questions': [

{ 'question_number': 1, 'question': 'Simplify $2^5 = \underline{\hspace{2cm}}$.', 'right_answer': '32',
'steps_to_solve': 'To simplify 2^5 , you need to calculate $2 * 2 * 2 * 2 * 2 = 32$.'},

{ 'question_number': 2, 'question': 'Fill in the blank: $4^3 = \underline{\hspace{2cm}}$.',
'right_answer': '64', 'steps_to_solve': 'To find the value of 4^3 , you need to
multiply 4 by itself 3 times: $4 * 4 * 4 = 64$.'},

{ 'question_number': 3, 'question': 'Find the missing value: $8^2 = \underline{\hspace{2cm}}$.',
'right_answer': '64', 'steps_to_solve': 'To find the missing value in 8^2 , you need to
calculate $8 * 8 = 64$.'},

{ 'question_number': 4, 'question': 'Solve the equation: $5^3 = \underline{\hspace{2cm}}$.',
'right_answer': '125', 'steps_to_solve': 'To solve the equation $5^3 = x$, you need to
calculate $5 * 5 * 5 = 125$.'},

{ 'question_number': 5, 'question': 'Complete the expression: $10^0 = \underline{\hspace{2cm}}$.',
'right_answer': '1', 'steps_to_solve': 'Any number raised to the power of 0 is always
equal to 1.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of exponents and powers.', 'right_answer': 'Exponents and powers are mathematical operations where a number (called the base) is multiplied by itself multiple times (called the exponent). The exponent represents the number of times the base is multiplied by itself. For example, in the expression 2^3 , 2 is the base and 3 is the exponent. It means 2 is multiplied by itself 3 times: $2 * 2 * 2 = 8$.', 'steps_to_solve': ''},

{'question_number': 2, 'question': 'Discuss the properties of exponents and powers.', 'right_answer': 'The properties of exponents and powers include:\n1. Product of Powers Rule: When multiplying powers with the same base, add their exponents.\n2. Quotient of Powers Rule: When dividing powers with the same base, subtract their exponents.\n3. Power of a Product Rule: To raise a product to a power, raise each factor to the power.\n4. Power of a Quotient Rule: To raise a quotient to a power, raise the numerator and denominator to the power.\n5. Negative Exponents Rule: A negative exponent indicates the reciprocal of the base raised to the positive exponent.\n6. Zero Exponent Rule: Any non-zero number raised to the power of zero is equal to 1.\n7. Power of Zero Rule: Zero raised to any positive exponent is equal to zero.', 'steps_to_solve': ''},

{'question_number': 3, 'question': 'Describe the process of solving exponential equations.', 'right_answer': 'To solve exponential equations, follow these steps:\n1. Rewrite the equation in exponential form if it is given in logarithmic form.\n2. Apply the properties of exponents to simplify both sides of the equation.\n3. Isolate the variable by getting rid of any other terms.\n4. Use logarithms if necessary to solve for the variable.\n5. Check the solution by substituting it back into the original equation.', 'steps_to_solve': ''},

{'question_number': 4, 'question': 'Explain the concept of negative exponents.', 'right_answer': 'Negative exponents indicate the reciprocal of the base raised to the positive exponent. They can be interpreted as flipping the base to the opposite side of the fraction. For example, 2^{-3} is equal to $1 / 2^3 = 1 / (2 * 2 * 2) = 1 / 8$.', 'steps_to_solve': ''},

{'question_number': 5, 'question': 'Discuss the use of exponents and powers in real-life applications.', 'right_answer': 'Exponents and powers are used in various

real-life applications, such as:\n1. Scientific notations for representing large or small numbers.\n2. Compound interest calculations in finance and investments.\n3. Population growth and decay models in biology and economics.\n4. Exponential growth and decay rates in physics and chemistry.\n5. Calculating distances in the universe using astronomical units.\n6. Data compression and encryption algorithms in computer science.\n7. Probability distributions in statistics and probability theory.', 'steps_to_solve': "]]}

50. Category: Statistics

OUTPUT =

```
{'multiple_choice_questions': [
```

```
{'question_number': 1, 'question': 'What is the median of the following set of numbers: 3, 5, 9, 11, 12, 17, 20?', 'option1': '5', 'option2': '9', 'option3': '11', 'option4': '12', 'right_answer_number': 2, 'right_answer': '9', 'steps_to_solve': 'Arrange the numbers in ascending order: 3, 5, 9, 11, 12, 17, 20. The median is the middle value, which is 9 in this case.'},
```

```
{'question_number': 2, 'question': 'What is the mode of the following set of numbers: 2, 4, 4, 6, 7, 9?', 'option1': '2', 'option2': '4', 'option3': '6', 'option4': '9', 'right_answer_number': 2, 'right_answer': '4', 'steps_to_solve': 'The mode is the number that appears most frequently. In this case, 4 appears twice, which is more than any other number.'},
```

```
{'question_number': 3, 'question': 'What is the range of the following set of numbers: 2, 5, 9, 12, 15, 18?', 'option1': '0', 'option2': '3', 'option3': '16', 'option4': '18', 'right_answer_number': 4, 'right_answer': '18', 'steps_to_solve': 'The range is the difference between the largest and smallest numbers in the set. In this case, the largest number is 18 and the smallest number is 2, so the range is  $18 - 2 = 16$ .'},
```

```
{'question_number': 4, 'question': 'What is the mean of the following set of numbers: 2, 4, 6, 8, 10?', 'option1': '4', 'option2': '6', 'option3': '8', 'option4': '10', 'right_answer_number': 3, 'right_answer': '6', 'steps_to_solve': 'To find the mean, add up all the numbers in the set and divide by the total number of numbers. In this case,  $(2 + 4 + 6 + 8 + 10) / 5 = 6$ .'},
```

{'question_number': 5, 'question': 'What is the mode of the following set of numbers: 5, 7, 9, 9, 11, 13, 13, 15, 15, 15?', 'option1': '5', 'option2': '9', 'option3': '13', 'option4': '15', 'right_answer_number': 4, 'right_answer': '15', 'steps_to_solve': 'The mode is the number that appears most frequently. In this case, 15 appears 3 times, which is more than any other number.'}],

'single_word_answer_type_questions': [

{'question_number': 1, 'question': 'What is the standard deviation of the following set of numbers: 4, 5, 6, 7, 8, 9?', 'right_answer': '1.58', 'steps_to_solve': 'To find the standard deviation, first find the mean of the set. Then, subtract the mean from each number and square the result. Find the mean of the squared differences, and take the square root of that mean. In this case, the mean is 6, so the squared differences are $(4-6)^2$, $(5-6)^2$, $(6-6)^2$, $(7-6)^2$, $(8-6)^2$, and $(9-6)^2$. The mean of the squared differences is 1.67, and the square root of 1.67 is approximately 1.58.'},

{'question_number': 2, 'question': 'What is the probability of rolling a 6 on a standard six-sided die?', 'right_answer': '1/6', 'steps_to_solve': 'A standard six-sided die has 6 equally likely outcomes. There is only 1 outcome that results in rolling a 6, so the probability is 1/6.'},

{'question_number': 3, 'question': 'What is the sum of the angles of a triangle?', 'right_answer': '180', 'steps_to_solve': 'The sum of the angles of a triangle is always 180 degrees. This is a property of triangles.'}],

'fill_in_the_blank_type_questions': [

{'question_number': 1, 'question': 'The product of 5 and 9 is ____.', 'right_answer': '45', 'steps_to_solve': 'The product of 5 and 9 is calculated by multiplying the two numbers together, which is 45 in this case.'},

{'question_number': 2, 'question': 'The square root of 64 is ____.', 'right_answer': '8', 'steps_to_solve': 'The square root of a number is a value that, when multiplied by

itself, gives the original number. In this case, the square root of 64 is 8 because $8 * 8 = 64$.'},

{'question_number': 3, 'question': 'The sum of 3 and 7 is ____.', 'right_answer': '10', 'steps_to_solve': 'To find the sum of two numbers, add them together. In this case, the sum of 3 and 7 is 10.'},

{'question_number': 4, 'question': 'The difference between 12 and 8 is ____.', 'right_answer': '4', 'steps_to_solve': 'To find the difference between two numbers, subtract the smaller number from the larger number. In this case, the difference between 12 and 8 is 4.'},

{'question_number': 5, 'question': 'The product of 6 and 7 is ____.', 'right_answer': '42', 'steps_to_solve': 'The product of 6 and 7 is calculated by multiplying the two numbers together, which is 42 in this case.'}],

'descriptive_type_questions': [

{'question_number': 1, 'question': 'Explain the concept of probability.', 'right_answer': 'Probability is a measure of the likelihood that a certain event will occur. It is often expressed as a number between 0 and 1, where 0 represents impossibility and 1 represents certainty. Probability is used in various fields to analyze and predict the outcomes of uncertain events, such as rolling a dice or flipping a coin. It helps us make informed decisions and understand the chances of different outcomes.'},

{'question_number': 2, 'question': 'Describe the steps to find the area of a rectangle.', 'right_answer': 'To find the area of a rectangle, multiply its length by its width. The formula for the area of a rectangle is $A = l \times w$, where A represents the area, l represents the length, and w represents the width. Measure the length and width of the rectangle in the same units, and then substitute the values into the formula to calculate the area.'},

{'question_number': 3, 'question': 'Explain the concept of slope in mathematics.', 'right_answer': "Slope is a measure of the steepness of a line. It is defined as the change in vertical distance (rise) divided by the change in horizontal distance (run) between any two points on a line. Slope is represented by the letter 'm' in the

slope-intercept form of a linear equation, $y = mx + b$, where 'm' is the slope and 'b' is the y-intercept. Positive slope indicates an upward or increasing trend, while negative slope indicates a downward or decreasing trend."},

{'question_number': 4, 'question': 'Explain the concept of mean in statistics.', 'right_answer': 'Mean is a measure of central tendency in statistics. It is calculated by adding up all the values in a set of data and dividing the sum by the total number of values. Mean represents the average value of the data set. It is commonly used to describe the typical value or the central value in a distribution. Mean can be affected by extreme values, so it may not always be the most representative measure of the data.'},

{'question_number': 5, 'question': 'Explain the concept of volume in geometry.', 'right_answer': 'Volume is the measure of the amount of space occupied by a three-dimensional object. It is usually expressed in cubic units, such as cubic centimeters or cubic meters. The volume of a solid can be calculated using different formulas depending on the shape of the object. For example, the volume of a rectangular prism is found by multiplying its length, width, and height. Volume is an important concept in various fields, such as architecture, engineering, and physics.'}}}

51. Category: Data Handling

OUTPUT =

```
multiple_choice_questions = [
```

```
{    "question_number": 1,    "question": "What is the sum of 2 and 3?",    "option1": "4",    "option2": "5",    "option3": "6",    "option4": "7",    "right_answer_number": 2,    "right_answer": "5",    "steps_to_solve": "2 + 3 = 5" },
```

```
{    "question_number": 2,    "question": "Which is the largest prime number?",    "option1": "23",    "option2": "37",    "option3": "49",    "option4": "55",    "right_answer_number": 2,    "right_answer": "37",    "steps_to_solve": "Check for prime numbers and find the largest one." },
```

```
{      "question_number": 3,      "question": "What is the square root of 36?",  
"option1": "4",      "option2": "6",      "option3": "9",      "option4": "12",  
"right_answer_number": 1,      "right_answer": "6",      "steps_to_solve":  
"The square root of a number is a value that, when multiplied by itself, gives the  
original number. The square root of 36 is 6." },
```

```
{      "question_number": 4,      "question": "What is the value of  $5 + 2 * 3$ ?",  
"option1": "20",      "option2": "16",      "option3": "11",      "option4": "9",  
"right_answer_number": 3,      "right_answer": "11",      "steps_to_solve":  
"Follow the order of operations: first perform any calculations inside parentheses,  
then perform multiplications and divisions from left to right, and finally perform  
additions and subtractions from left to right. In this case,  $2 * 3$  equals 6, and  $5 + 6$   
equals 11." },
```

```
{      "question_number": 5,      "question": "What is the value of  $(4 + 2) * (8 / 4)$ ?",  
"option1": "9",      "option2": "12",      "option3": "18",      "option4":  
"24", "right_answer_number": 2,      "right_answer": "12",  
"steps_to_solve": "First, perform the calculations inside the parentheses:  $4 + 2$   
equals 6 and  $8 / 4$  equals 2. Then multiply the results:  $6 * 2$  equals 12." } ]
```

```
single_word_answer_type_questions = [
```

```
{      "question_number": 1,      "question": "What is the opposite of 'up'?",  
"right_answer": "down",      "steps_to_solve": "The opposite of up is down." },
```

```
{      "question_number": 2,      "question": "What is the capital of France?",  
"right_answer": "paris",      "steps_to_solve": "The capital of France is Paris." },
```

```
{      "question_number": 3,      "question": "What is the primary color?",  
"right_answer": "red",      "steps_to_solve": "The primary colors are red, blue,  
and yellow." } ]
```

```
fill_in_the_blank_type_questions = [
```

```
{      "question_number": 1,      "question": "The sum of 5 and 3 is ____.",  
"right_answer": "8",      "steps_to_solve": "To find the sum of 5 and 3, simply  
add them together:  $5 + 3 = 8$ ." },
```

```
{      "question_number": 2,      "question": "The square root of 49 is ____.",  
"right_answer": "7",      "steps_to_solve": "The square root of a number is a  
value that, when multiplied by itself, gives the original number. The square root of  
49 is 7." },
```

```
{      "question_number": 3,      "question": "The capital of India is ____.",  
"right_answer": "new delhi",      "steps_to_solve": "The capital of India is New  
Delhi." },
```

```
{      "question_number": 4,      "question": "The product of 4 and 6 is ____.",  
"right_answer": "24",      "steps_to_solve": "To find the product of 4 and 6,  
simply multiply them together:  $4 * 6 = 24$ ." },
```

```
{      "question_number": 5,      "question": "The square of 9 is ____.",  
"right_answer": "81",      "steps_to_solve": "To find the square of a number,  
simply multiply the number by itself. The square of 9 is  $9 * 9 = 81$ ." } ]
```

```
descriptive_type_questions = [
```

```
{      "question_number": 1,      "question": "Explain the process of finding the  
area of a rectangle.",      "right_answer": "To find the area of a rectangle,  
multiply its length by its width. The formula for finding the area of a rectangle is:  
Area = Length * Width. For example, if a rectangle has a length of 5 units and a  
width of 3 units, the area would be  $5 * 3 = 15$  square units.",      "steps_to_solve":  
"1. Identify the length and width of the rectangle.\n2. Multiply the length and  
width together.\n3. Write the result as the area of the rectangle." },
```

```
{      "question_number": 2,      "question": "Explain the process of solving a  
quadratic equation.",      "right_answer": "A quadratic equation is an equation  
of the form  $ax^2 + bx + c = 0$ , where a, b, and c are constants. To solve a quadratic  
equation, follow these steps:\n1. Factor the quadratic equation if possible.\n2. Set  
each factor equal to zero and solve for x.\n3. If factoring is not possible, use the  
quadratic formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .",      "steps_to_solve":      "1.
```

Determine if the equation can be factored.\n2. Set each factor equal to zero and solve for x.\n3. Apply the quadratic formula if factoring is not possible.\n4. Write the solutions as $x = (\text{solution 1})$, $x = (\text{solution 2})$." },

{ "question_number": 3, "question": "Describe the process of finding the mean of a set of numbers.", "right_answer": "To find the mean of a set of numbers, add up all the numbers in the set and then divide the sum by the total number of values in the set. For example, if the set is {2, 4, 6, 8, 10}, the mean would be $(2 + 4 + 6 + 8 + 10) / 5 = 6$.", "steps_to_solve": "1. Add up all the numbers in the set.\n2. Count how many numbers are in the set.\n3. Divide the sum by the count to find the mean." },

{ "question_number": 4, "question": "Explain the process of solving a system of linear equations.", "right_answer": "A system of linear equations is a set of two or more linear equations with the same variables. To solve a system of linear equations, follow these steps:\n1. Write down all the equations in the system.\n2. Choose a method to solve the system (e.g., substitution, elimination, or graphing).\n3. Apply the chosen method to find the values of the variables.\n4. Check the solution by substituting the values back into the original equations.", "steps_to_solve": "1. Write down all the equations in the system.\n2. Choose a method to solve the system.\n3. Apply the chosen method to find the values of the variables.\n4. Check the solution by substituting the values back into the original equations." },

{ "question_number": 5, "question": "Explain the process of finding the nth term in an arithmetic sequence.", "right_answer": "In an arithmetic sequence, each term is found by adding a constant difference to the previous term. To find the nth term in an arithmetic sequence, use the formula: nth term = first term + $(n - 1) * \text{common difference}$. For example, in the sequence 2, 5, 8, 11, 14, the common difference is 3. The formula would be: nth term = $2 + (n - 1) * 3$.", "steps_to_solve": "1. Identify the first term and the common difference in the sequence.\n2. Use the formula: nth term = first term + $(n - 1) * \text{common difference}$.\n3. Substitute the value of n into the formula to find the nth term." }]