**PROBLEM STATEMENT #2**

**Ideated by: Swami Pragya Prashant**

**Subject:** Biology  
**Title**: Food Sources and Components

**Type:** Adaptive Simulation.

**Description**: This simulation aims to teach class 6 students the basics of ***Food: Its ingredients, sources, and the nutritional composition.***

Goutham goes to a mall/fair on a Saturday evening with his parents. After doing lots of fun-filled activities, he gets hungry. So his parents take him to a food court. There he sees a sea of dishes across multiple cuisines. As a curious kid, he asks his Mother/ Father about where the food comes from. The parent who is also a Science Teacher uses this opportunity to teach some important concepts about food to Goutham. Goutham is asked to prepare a list of food items and dishes he can think of. The parent then helps Goutham identify the ingredients of the dishes and their sources as plants or animals. Goutham is also made to learn about the different components of food by some interesting tests.

Next day Goutham was playing in his garden, when he saw a squirrel nibbling on nuts. As a curious kid Goutham again went to his Mother/Father and asked about what animals eat. His parent asks him to prepare a list of the animals he can think of. Goutham’s parent explains that the eating habits of the animals can be guessed from their teeth structure and accordingly explains whether an animal (from Goutham’s list ) is a herbivore, carnivore or omnivore.

The students will be made to answer Goutham’s queries on the behalf of his parent.

**Case I**

1. Students will be provided with a list of 25-30 meals/dishes and their ingredients.

2. They will have to identify the source of the ingredient and its sub divisions: Plant – which part of the plant does the ingredient belong to? Animals – direct or indirect product?

3. Test the ingredients for their nutritive components: carbohydrates, proteins, and fats. Other minerals, and vitamins present in the ingredient (if any) will be provided as extra information.

4. A final assessment of the meal shall be made to check whether it is a balanced diet or not.

**Case II**

1. A list of 25-30 animals with the diagram of their teeth will be provided.

2. Based on the teeth type, students will have to judge whether the animal is herbivorous, carnivorous or omnivorous.

**Parameters to be varied and mathematical modeling:**

|  |  |
| --- | --- |
| **Meal** | **Ingredients** |
| Biryani | chicken,boiled rice , onions , chicken masala, ginger garlic paste and karan for cooking |
| daal baati churma | chana dal, moong dal, wheat flour, besan,tomato |
| litti chokha | sattu, ginger garlic paste, onions, potato,tomato |
| Rajma, Rice | Boiled Rajma , onions, tomatoes , masala paste , Boiled rice |
| dahi vada | curd, urad daal, ginger, salt |
| Pulichery | Curd,coconut,garlic,onion,curry leaf,chilly |
| omlette | eggs , oil , onions. |
| chettinad potato fry | potato, water, onion, tomato, gingly oil, curry leaves, garlic, chilli powder, turmeric powder, coriander powder |
| Gobi manchurian | cauliflower , tomatoes, chilli powder ,Masala paste |
| Mushroom curry | Mushroom,tomatoes,onions,garlic paste,cheese,malai,garam masala,meethi seeds. |
| Dal tadka | Tomatoes, onions, chana dal, water, green chillies, coriander, ghee, mustard, jeera, methi seeds, turmeric powder, garam masala, salt |
| Dal Makhani | Tomatoes,onions,urad dal,water,green chillies,coriander,oil,jeera,turmeric powder,rajma,garam masala,salt. |
| Kheer | Rice, Sugar, Cashews, Milk, Raisins |
| Mutton curry | Mutton, Onion, tomatoes, lime, ginger garlic paste, garam masala, salt, chili powder, Turmeric powder |
| Avial | (Mix of all vegetable) Potato, tomato, onion, drumstick, cucumber, pumpkin, spices (turmeric, chilly powder). |
| Pulichery | Curd,coconut,garlic,onion,curry leaf,chilly |
| Beetroot Halwa | Beetroot, Ghee, Sugar, Cashews. Raisins |
| Egg curry | Egg, onion, tomato, curry leaves, chilli pwder, tamrind, turmeric powder, coriander powder, mustard, garlic |
| palak paneer | palak paneer onion |
| momos | cauliflower,salt,cake flour. |
| Tabak Maaz | Lamb ribs, Milk, Dry ginger powder, Powdered aniseeds,Turmeric powder,Powdered cinnamon, Asafoetida powder, Cloves |
| Makki roti - Sarson ka saag | sarson saag, palak saag, bathua saag,green chilly, ginger, onions, cloves of garlic, ghee, red pepper powder, garam masala, coriander powder, makki atta, water |
| Bebinca | refined flour, yolks, sugar, coconut milk, nutmeg powder, butter |
| Kodi kura | chicken, red chili powder, onions, green chili, ginger garlic paste, Oil, tomato, mint leaves, Poppy seeds or 10 cashewnuts, Coconut, Garam masala powder |
| Masor Tenga | river fish, tomatoes, fenugreek seeds, turmeric powder, green chili, lemon juice, mustard oil, chopped coriander, Salt, warm water |

**Nutritional Profile of the Ingredients:-**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ingredients** | **Carbohydrates** | **Protein** | **Fats** | **Source** |
| Asafoetida powder | Y | Y | N | Plant - Resin of the tap root |
| bathua saag | Y | Y | N | Plant - leaves |
| Beetroot | Y | Y | N | Plant - Tap root |
| besan(chickpea flour) | Y | Y | Y | Plant - seed |
| Boiled rice | Y | Y | N | Plant - seed |
| butter | N | N | Y | Animal - milk derivative |
| cake flour | Y | Y | N | Plant - seed derivative |
| Cashew nuts | Y | Y | Y | Plant - seed |
| cauliflower | Y | Y | N | plant - florets |
| chana dal | Y | Y | N | Plant - seed |
| Cheese | N | Y | Y | Animal - milk derivative |
| Chicken | Y | Y | Y | Animal - body meat |
| chilli powder , | Y | Y | Y | Plant - fruit and seeds |
| green chilly | Y | Y | N | Plant - fruit |
| chopped coriander | Y | Y | N | Plant - leaves |
| Cloves | Y | N | Y | Plant - buds |
| Coconut | Y | N | Y | Plant - fruit |
| Coconut milk | Y | N | Y | Palnt - fruit |
| Cucumber | Y | N | N | Plant - fruit |
| Curd | Y | Y | Y | Animal - milk derivative |
| curry leaves | Y | Y | N | plant - leaves |
| Drumstick | Y | Y | N | palnt - fruit |
| Dry ginger powder | Y | Y | N | plant - stem |
| Eggs | Y | Y | Y | Animal - fertilized immature embryo |
| fenugreek seeds | Y | Y | N | plant - seeds |
| Garlic | Y | Y | N | plant - swollen stem |
| Ghee, | N | N | Y | Animal - milk derivative |
| sesame oil | N | N | Y | Plant - seeds |
| jeera | Y | Y | Y | Plant -seed |
| Lamb ribs | N | Y | Y | Animal - body meat |
| lime, | Y | N | N | Plant - fruit |
| makki atta | Y | Y | N | Plant - seed |
| Milk | Y | Y | Y | Animal - milk |
| mint leaves | Y | Y | N | plant - leaves |
| moong dal | Y | Y | N | plant - seeds |
| Mushroom | Y | Y | N | Fungus - Fruit |
| mustard | Y | Y | N | plant - leaves |
| mustard oil | N | N | Y | plant - seeds |
| Mutton, | N | Y | Y | animal - body meat |
| nutmeg powder | Y | N | Y | Plant - seeds |
| Onion | Y | N | N | Plant - swollen stem |
| palak | Y | Y | N | Plant - leaves |
| paneer | Y | Y | Y | Animal - milk derivative |
| Poppy seeds | Y | Y | Y | Plant -seed |
| Potato | Y | Y | N | plant - stem/tuber |
| Powdered anise seeds | Y | N | N | plant - seeds |
| Powdered cinnamon | Y | Y | N | plant - bark |
| Pumpkin | Y | Y | N | Plant - fruit |
| Raisins | Y | Y | N | plant - fruit |
| Rajma | Y | Y | N | plant - seed |
| refined flour | Y | Y | N | plant - seeds |
| Rice | Y | Y | N | plant -seeds |
| river fish | N | Y | Y | Animal - body meat |
| Salt |  |  |  |  |
| sattu | Y | Y | Y | plant - seeds |
| Sugar | Y | N | N | plant - stem |
| tamarind | Y | Y | N | plant - fruit |
| Tomato | Y | N | N | plant - fruit |
| Turmeric powder | Y | Y | Y | plant - swollen stem |
| urad dal | Y | Y | Y | plant - seeds |
| yolks | Y | Y | Y | Animal - immature embryo |

**Animals and their eating habits:-**

|  |  |  |
| --- | --- | --- |
| **Sl.** | **Animal** | **Eating habit** |
| 1 | Lion | C |
| 2 | Elephant | H |
| 3 | Porcupine | O |
| 4 | Badger | C |
| 5 | Squirrel | H |
| 6 | Bear | O |
| 7 | Beaver | H |
| 8 | Jackal | C |
| 9 | Sea lion | C |
| 10 | Barasingha Deer | H |
| 11 | Rhinoceros | H |
| 12 | Kangaroo | H |
| 13 | Shark | C |
| 14 | boar | O |
| 15 | Bobcat | C |
| 16 | Hyena | C |
| 17 | Lemur | H |
| 18 | Buffalo | H |
| 19 | Camel | H |
| 20 | Brown Capuchin Monkey | H |
| 21 | Reindeer | H |
| 22 | Chimpanzee | O |
| 23 | Chipmunk | H |
| 24 | Cobra | C |
| 25 | Collared lizard | C |
| 26 | Zebra | H |
| 27 | Raccoon | O |
| 28 | Crocodile | C |
| 29 | Komodo Dragon | C |
| 30 | Fox | O |

**Test conditions:**

1. **Carbohydrate Test –** Take small quantity of the ingredient and add 2-3 drops of dilute Iodine solution on it. Ingredients with carbohydrates will turn to blue-black.
2. **Protein Test –** Preprae a paste of the ingreident by mashing it. Take a small amount of this paste in a test tube and add 10 drops of water to it and shake well. Add 2-3 drops of CuSO4 solution and ten drops of caustic soda to the tube. Ingredients with protein will yield a violet coloration.
3. **Fat Test –** Take a small amount of the ingredient and crush it inside a paper carefully such that the paper is not torn. The ingredients with fat will leave an oily patch on the paper.
4. **Algorithm for Balanced Diet –**i. Count the number of ingredients of the meal.   
   ii. For individual ingredients, there should be a minimum of 2 out of 3 possible Ys.  
   iii. If number of such ingredients is more than 70% of the total number of ingredients, and there is at least one Y in all three categories, then it is a balanced diet.

**Template:**

**Meal:**  Egg Curry

Identified Ingredients: Egg, onions, garlic, mustard oil, tomatoes, spices (cardamom, coriander, cumin, and turmeric), salt and water.

Sources:

|  |  |
| --- | --- |
| Eggs | Hen (Animal – Direct) |
| Onions | Plants-stem |
| Tomatoes | Plants – Fruit |
| Garlic | Plants – Stem |
| Mustard oil | Plants – Seeds |
| Spices | Plants |

Nutrients:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ingredient | Carbohydrate | Proteins | Fats | Vitamins | Minerals |
| Eggs | Yes | Yes | Yes | A,D, B-6 & B-12 | Calcium, iron and magnesium |
| Onions | Yes | Yes | No | C & B-6 | Calcium, iron and magnesium |
| Tomatoes | Yes | Yes | No | A,C & B-6 | Calcium, iron and magnesium |
| Garlic | Yes | Yes | No | C & B-6 | Calcium, iron and magnesium |
| Mustard oil | No | No | Yes | None | None |

Balanced Diet: Yes.

**Identify the eating habit of following animal:**

Animal: Porcupine

Teeth:

Eating habit: Herbivorous