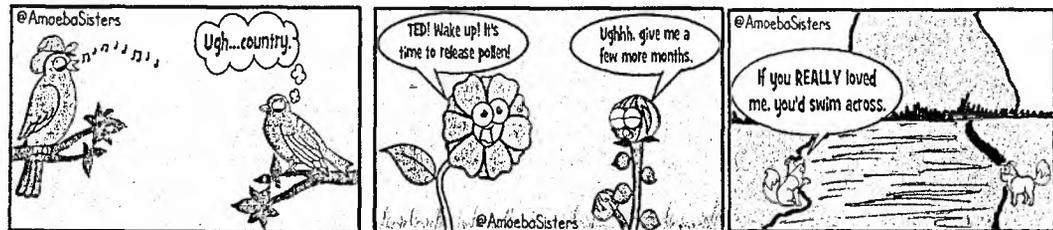


1. The common peppered moth *Biston betularia* has two varieties, one is silvery white and the other is peppered. It was observed that the numbers of the peppered variety in Manchester increased during the industrial revolution, and again decreased during the green revolution. This phenomenon has been called industrial melanism. Using a flowchart or bullet points, explain these observations with respect to Darwin's theory of natural selection. (2)
2. Name two sources of natural variation in a population. (2)
3. Explain how random genetic drift is different from natural selection. (2)
4. A team of researchers discovered the nest of a new ant species. The nest was found to be multi-chambered with tunnels connecting the chambers, and spread of several kilometers underground. They wanted to understand whether this large labyrinth of chambers and tunnels was the nest of a single queen or multiple queens. They genotyped brood (maturing offspring) from different chambers to answer this question. If the chambers had both male and female brood, which of these should they analyze and why? (3)
5. Identify the evolutionary mechanism being represented by the following images: (3)



6. We share 50% of our genes with our siblings. Humans share 98.8% of their genes with chimpanzees. Explain how both these statements can be true? (3)
7. Calculate the genetic relatedness between: (5)
  - i) A honeybee queen and a worker in her colony
  - ii) A worker ant and its sister's son
  - iii) A dog and her daughter's daughter
  - iv) Two worker wasps in a colony where the queen has mated with one male
  - v) A drone and his sister

*[Handwritten signature]*  
15/2/19