1. What does one mean by the term "machine learning"?

Machine learning is the science of getting computers to act without being explicitly programmed.

2.Can you think of 4 distinct types of issues where it shines?

1. Identifying Spam
2. Image & Video Recognition
3. Fraudulent Transactions
4. Demand Forecasting

3.What is a labeled training set, and how does it work?

In ML labeled data is available in the form of a training set & The training set is used to train the algorithm, and then you use the trained model on the test set to predict the response variable values that are already known.

4.What are the two most important tasks that are supervised?

1. Based on past information about spams, filtering out a new incoming email into Inbox (normal) or Junk folder (Spam)
2. Based on some prior knowledge (when its sunny, temperature is higher; when its cloudy, humidity is higher, etc.) weather apps predict the parameters for a given time.

5.Can you think of four examples of unsupervised tasks?

1. A friend invites you to his party where you meet totally strangers. Now you will classify them using unsupervised learning (no prior knowledge) and this classification can be on the basis of gender, age group, dressing, educational qualification or whatever way you would like. Why this learning is different from Supervised Learning? Since you didn't use any past/prior knowledge about people and classified them "on-the-go".
2. NASA discovers new heavenly bodies and finds them different from previously known astronomical objects - stars, planets, asteroids, blackholes etc. (i.e. it has no knowledge about these new bodies) and classifies them the way it would like to (distance from Milky way, intensity, gravitational force, red/blue shift or whatever)
3. Let's suppose you have never seen a Cricket match before and by chance watch a video on internet, now you can classify players on the basis of different criterion: Players wearing same sort of kits are in one class, Players of one style are in one class (batsmen, bowler, fielders), or on the basis of playing hand (RH vs LH) or whatever way you would observe [and classify] it.
4. We are conducting a survey of 500 questions about predicting the IQ level of students in a college. Since this questionnaire is too big, so after 100 students, administration decides to trim the questionnaire down to fewer questions and for it we use some statistical procedure like PCA to trim it down.

6.State the machine learning model that would be best to make a robot walk through various unfamiliar terrains?

Reinforced Learning

7.Which algorithm will you use to divide your customers into different groups?

K-means clustering

8.Will you consider the problem of spam detection to be a supervised or unsupervised learning problem?

supervised learning

9.What is the concept of an online learning system?

An online learning system can learn incrementally, as opposed to a batch learning system. This makes it capable of adapting rapidly to both changing data and autonomous systems, and of training on very large quantities of data

10.What is out-of-core learning, and how does it differ from core learning?

Out-of-core algorithms can handle vast quantities of data that cannot fit in a computer's main memory. An out-of-core learning algorithm chops the data into mini-batches and uses online learning techniques to learn from these mini-batches.

11.What kind of learning algorithm makes predictions using a similarity measure?

instance-based algorithm.

12.What's the difference between a model parameter and a hyperparameter in a learning algorithm?

A model has one or more model parameters that determine what it will predict given a new instance (e.g., the slope of a linear model). A learning algorithm tries to find optimal values for these parameters such that the model generalizes well to new instances. A hyperparameter is a parameter of the learning algorithm itself, not of the model (e.g., the amount of regularization to apply).

13.What are the criteria that model-based learning algorithms look for? What is the most popular method they use to achieve success? What method do they use to make predictions?

The goal for a model-based algorithm is to be able to generalize to new examples. To do this, model based algorithms search for optimal values for the model's parameters, often called theta. This searching, or "learning", is what machine learning is all about. Model-based system learn by minimizing a cost function that measures how bad the system is at making predicitons on new data, plus a penalty for model complexity if the model is regularized. To make a prediction, a new instance's features are fed into a hypothesis function which uses the minimized theta found by repeatedly running the cost function.

14.Can you name four of the most important Machine Learning challenges?

Some of the main challenges in Machine Learning are the

1. lack of data,

2. poor data quality,

3. nonrepresentative data,

4. uninformative features,

5. excessively simple models that underfit the training data

6. complex models that overfit the data.

15.What happens if the model performs well on the training data but fails to generalize the results to new situations? Can you think of three different options?

If a model performs great on the training data but generalizes poorly to new instances, the model is likely overfitting the training data (or we got extremely lucky on the training data). Possible solutions to overfitting are getting more data, simplifying the model (selecting a simpler algorithm, reducing the number of parameters or features used, or regularizing the model), or reducing the noise in the training data.

16.What exactly is a test set, and why would you need one?

A test set is used to estimate the generalization error that a model will make on  
new instances, before the model is launched in production.

17.What is a validation set's purpose?

A validation set is used to compare models. It makes it possible to select the best model and tune the hyperparameters.

18.What precisely is the train-dev kit, when will you need it, how do you put it to use?

The goal of dev-set is to rank the models in term of their accuracy and helps us decide which model to proceed further with. Using Dev set we rank all our models in terms of their accuracy and pick the best performing model.

19.What could go wrong if you use the test set to tune hyperparameters?

If you tune hyperparameters using the test set, you risk overfitting the test set,  
and the generalization error you measure will be optimistic (you may launch a  
model that performs worse than you expect).