React

Interview Questions

(Practice Project)

PW SKILLS

Interview Questions

Easy

Q. What is the difference between state and props?

Ans:
In React, both state and props are plain JavaScript objects and used to manage the data of a component, but they are used in different ways and have different characteristics. state is managed by the component itself and can be updated using the setState() function. Unlike props, state can be modified by the component and is used to manage the internal state of the component. Changes in the state trigger a re-render of the component and its children. props (short for "properties") are passed to a component by its parent component and are read-only, meaning that they cannot be modified by the component itself. props can be used to configure the behavior of a component and to pass data between components.

Q. What are Hooks? and mention different types of hooks?

Ans:
React Hooks are functions that enable functional components to use state and lifecycle features previously only available in class components. Introduced in React 16.8, Hooks provide a more straightforward and concise way to manage component state and side effects in functional components, making them more powerful and expressive.

Here are some key React Hooks:

1. useState
2. useEffect
3. useContext
4. useReducer
5. useCallback
6. useMemo
7. useRef
8. useImperativeHandle
9. useLayoutEffect
10. useDebugValue

Q. What is useState() in React?

Ans:
The useState() is a built-in React Hook that allows you for having state variables in functional components. It should be used when the DOM has something that is dynamically manipulating/controlling.

In the below-given example code, The useState(0) will return a tuple where the count is the first parameter that represents the counter's current state and the second parameter setCounter method will allow us to update the state of the counter.

```
const [count, setCounter] = useState(0);
const setCount = () => {
   setCounter(count + 1);
};
```

We can make use of the setCounter() method for updating the state of count anywhere. In this example, we are using setCounter() inside the setCount function where various other things can also be done. The idea with the usage of hooks is that we will be able to keep our code more functional and avoid class-based components if they are not required.

Q. What is the use of useEffect React Hooks?

Ans:
The useEffect hook in React is used to perform side effects in functional components. Side effects are operations or behaviors that happen outside the scope of the normal component rendering, such as data fetching, subscriptions, manual DOM manipulations, or any other asynchronous tasks.

The useEffect hook allows you to execute such side effects after the component has rendered or when certain dependencies have changed. It replaces lifecycle methods like componentDidMount, componentDidUpdate, and componentWillUnmount in class components.

1. Data Fetching:
Use useEffect to fetch data from an API or other external source after the component has mounted.

```
  useEffect(() => {
  const fetchData = async () => {
    try {
      const result = await fetchDataFromAPI();
      // Update state or perform other actions with the
data
    } catch (error) {
      // Handle errors
    }
  };
  fetchData();
}, []); // Empty dependency array means the effect runs
once after the initial render.
```

2. Component Lifecycle Events:
Mimic the behavior of lifecycle methods in class components, such as componentDidMount, componentDidUpdate, and componentWillUnmount.

```
useEffect(()
 => {
// ComponentDidMount: Logic to run after the component has
mounted
return () => {
// ComponentWillUnmount: Cleanup logic before the component
is unmounted
}; }, [dependencies]);
 // Dependencies array determines when the effect should
run.
```

3. Subscriptions and Event Listeners:
Use useEffect to subscribe to external events or set up event listeners.

```
useEffect(() => {
  const subscription = subscribeToExternalEvent();
  return () => {
    // Cleanup logic when the component is unmounted or
when dependencies change
    subscription.unsubscribe();
  };
}, [dependencies]);
```

4. Manual DOM Manipulations:
- Perform manual DOM manipulations after the component has been rendered.

```
useEffect(() => {
  // Manipulate the DOM directly or perform other
imperative operations
  return () => {
    // Cleanup logic if needed
  };
}, [dependencies]);
```

5. Timer Functions:
- Use useEffect for tasks involving timers or intervals.

```
useEffect(() => {
  const timerId = setInterval(() => {
    // Logic to run at intervals
  }, 1000);
  return () => {
    // Cleanup logic when the component is unmounted or
when dependencies change
    clearInterval(timerId);
 };
}, [dependencies]);
```

6. Global State Management:
- Integrate with global state management libraries or contexts.

```
useEffect(() => {
  // Perform actions related to global state management
  return () => {
    // Cleanup logic if needed
  };
}, [dependencies]);
```

useEffect ensures that side effects are not blocking the rendering of the component. It runs after the render is committed to the screen, and the cleanup function (returned by useEffect) is executed before the next render or when the component is unmounted. The dependencies array helps control when the effect should run and clean up.

Q. What is the difference between useEffect and uselayoutEffect?

Ans:

- **Difference:-**

useEffect:

- useEffect is asynchronous and is executed after the browser has painted the screen, i.e., after the DOM has been updated.
- It does not block browser painting and is typically used for less critical updates or side effects that don't need to be immediately reflected in the UI.
- It's ideal for performing tasks like data fetching, DOM manipulation, or setting up subscriptions.

useLayoutEffect:

- useLayoutEffect is synchronous and is executed immediately after the DOM has been updated but before the browser has painted the screen.
- It blocks browser painting and can cause jank or UI stutter if used for heavy computations or long-running tasks.
- It's useful when you need to perform side effects that depend on the dimensions or layout of the DOM, as it runs before the browser has had a chance to paint the updated layout.

Q. What is the difference between useState and useReducer?

Ans:

Difference:-

useReducer:-

- useReducer is an advanced hook used for managing complex state logic in functional components.
- It follows the reducer pattern, where you define a reducer function that specifies how state updates should be performed based on dispatched actions.
- It returns the current state and a dispatch function to trigger actions.
- It's typically used for managing state that involves complex logic, multiple related values, or state transitions that depend on the previous state.

useState:-

- useState is a basic hook used for managing simple state variables in functional components.
- It returns a state variable and a function to update that state variable.
- It's typically used for managing independent or closely related state values.
- It's straightforward and easy to use, making it suitable for simple state management needs.

Q. List some techniques for optimizing React applications.

Ans:

- **React.memo:** Memoize functional components to prevent unnecessary re-renders.
- **Code Splitting:** Divide the app into smaller chunks for faster loading.
- **Lazy Loading:** Load components and assets asynchronously to improve initial load times.
- **Bundle Optimization:** Analyze and optimize bundle size by removing unused code and splitting dependencies.
- **Memoization:** Memoize computations and event handlers to avoid redundant calculations.
- **Virtualization:** Render only visible content to reduce memory usage and improve performance.
- **Image and Asset Optimization:** Compress and lazy load assets to reduce file size.
- **Minimize Re-renders:** Optimize component re-renders to improve performance.
- **React.StrictMode:** Enable development mode checks for better code quality.

Q. Explain the concept of "pure components" in React.

Ans:
Pure components are React components that implement a shouldComponentUpdate method with a shallow prop and state comparison. They only re-render when the data they receive or hold has changed. Pure components optimize rendering performance by preventing unnecessary re-rendering.
In functional components, the concept of pure components is achieved through the use of React.memo higher-order component. React.memo is similar to the automatic behavior of pure components in class components; it memorizes the functional component to prevent unnecessary renders when its props haven't changed.

Q.Explain the difference between useMemo() and useCallback() hooks in React.

Ans:
useMemo and useCallback are both React hooks that are used to optimize performance, but they serve different purposes.

- **useMemo Hook:-**

The useMemo hook is used to memoize the result of a computation. It takes a function and an array of dependencies. The function is only re-executed if any of the dependencies change. It returns a memoized value, and the memoized value is cached and reused as long as the dependencies remain unchanged.

```
const memoizedValue = useMemo(() ⇒
computeExpensiveValue(a, b), [a, b]);
```

In this example, the function computeExpensiveValue is only called when a or b change. The result is memoized and reused if the dependencies don't change.

- **useCallback Hook:**

The useCallback hook is used to memorize a callback function. It also takes a function and an array of dependencies. The memoized callback function is only recreated if any of the dependencies change. It is particularly useful when passing callbacks to child components to prevent unnecessary re-renders.

```
const memoizedCallback = useCallback(() ⇒ {
  doSomething(a, b);
}, [a, b]);
```

In this example, the callback function is memoized, and memoizedCallback will remain the same between renders unless a or b changes.

Key Differences:

1. **Use Case:**
   - Use useMemo when you want to memoize the result of a computation.
   - Use useCallback when you want to memorize a callback function.
2. **Return Value:**
   - useMemo returns the memoized value.
   - useCallback returns the memoized callback function.
3. **Typical Use:**
   - useMemo is commonly used for memoizing expensive computations or complex data transformations.
   - useCallback is commonly used when passing callbacks to child components to prevent unnecessary re-renders.
4. **Example:**
   - useMemo is used for memorizing values.
   - useCallback is used for memoizing functions.

```
const memoizedValue = useMemo(() =>
computeExpensiveValue(a, b), [a, b]);
const memoizedCallback = useCallback(() => {
  doSomething(a, b);
}, [a, b]);
```

While both hooks involve memoization, useMemo is used for values, and useCallback is used for callback functions. They are tools for optimizing performance in different scenarios.

Q. Can you modify props directly within a component? Why or why not?

Ans:
No, you cannot modify props directly within a component. Props in React are immutable, meaning they cannot be changed once set by the parent component. This immutability ensures that data flows in a single direction, from parent to child, which helps in maintaining the predictability of the application's state.

Q. What is the purpose of the "React.StrictMode" component?

Ans:
React.StrictMode is a development-only component in React that enables additional checks and warnings to catch common mistakes and potential issues in the application code. It helps identify unsafe practices, deprecated features, and unintended side effects during development. It is not used in production.

Q. What is the purpose of the "React.memo" function in React?

Ans:
The React.memo function is a higher-order component (HOC) that memorizes a functional component. It helps optimize performance by preventing unnecessary re-renders of the component when its props haven't changed. It is similar to PureComponent for class components.

Q.When would you prefer to use a class component over a functional component, and vice versa?

Ans:
Use class components when you need to manage state, use lifecycle methods, or implement more complex logic like event handling. Functional components are preferred for their simplicity, reusability, and better performance due to being lightweight. With the introduction of Hooks in React, functional components can now also manage state and side effects, reducing the need for class components in many cases.

Q.Can JSX contain JavaScript expressions?

Ans:
Yes, JSX can contain JavaScript expressions. You can embed JavaScript expressions inside curly braces {} within JSX to evaluate dynamic values or execute functions.

Q.How does React differ from other JavaScript frameworks?

Ans:
React differs from other JavaScript frameworks in several ways:
React uses a virtual DOM to efficiently update the actual DOM, improving performance.
It emphasizes a component-based architecture for building UIs, promoting reusability and maintainability.
React focuses solely on the view layer of the application, allowing for greater flexibility and interoperability with other libraries and frameworks.
React promotes a unidirectional data flow, making it easier to reason about the application's state.

Q.Explain the Virtual DOM in React and how it helps in optimizing performance.

Ans:
The Virtual DOM is a lightweight, in-memory representation of the actual DOM. When changes are made to the state of a component in React, a new Virtual DOM tree is created and compared with the previous one. React then calculates the minimal set of DOM mutations needed to update the actual DOM, reducing the performance overhead of directly manipulating the DOM. This approach improves performance by minimizing unnecessary re-renders and DOM manipulations.

Q.What is the difference between onClick and onSubmit events?

Ans:
onClick is an event handler used for handling click events, commonly used with elements like buttons or links. onSubmit, on the other hand, is an event handler used for handling form submission events, typically used with <form> elements. While onClick triggers when a user clicks an element, onSubmit triggers when a form is submitted, either by clicking a submit button or pressing Enter while focused on a form input.

Q. Explain event delegation in React and its significance.

Ans:
Event delegation in React involves attaching event listeners to parent elements instead of individual child elements. When an event occurs, it bubbles up from the target element to its parent elements, allowing a single event handler to manage events for multiple elements. This approach improves performance and reduces memory consumption, especially in scenarios with large numbers of dynamically generated elements.

Q.What are the different approaches for conditional rendering?

Ans:
There are several approaches for conditional rendering in React:
Using conditional statements like if or ternary operators in JSX.
Rendering components conditionally based on state or props.
Using logical operators like && or || to conditionally render elements.

Q.List some built-in React Hooks and their use cases.

Ans:
Some built-in React Hooks include:

- useState: Used to add state to functional components.
- useEffect: Used to perform side effects in functional components, such as data fetching or DOM manipulation.
- useContext: Used to consume context values in functional components.
- useReducer: Used to manage state in a more complex manner, often used as an alternative to useState for more advanced scenarios.

Q.Explain the rules of using Hooks in React and why they are important.

Ans:
Rules for using Hooks in React include:
Hooks can only be called at the top level of functional components or custom Hooks, not within loops, conditions, or nested functions.
Hooks must always be called in the same order within a component.
Custom Hooks must start with the word "use" to enable React's static analysis tools to detect them.
Following these rules ensures consistent behavior and helps prevent bugs in React applications.

Q.How do you handle forms in React?

Ans:
Forms in React can be handled by:
Using controlled components, where form data is controlled by React state.
Handling form submission using the onSubmit event handler.
Validating form input and managing form state using React state or form libraries like Formik or Redux Form.

Q.Explain the role of reducers in Redux and how they work.

Ans:
Reducers in Redux are pure functions responsible for handling state transitions in response to dispatched actions. They take the current state and an action as arguments and return a new state based on the action type. Reducers should not modify the existing state but rather return a new state object. They play a crucial role in maintaining the single source of truth for the application state in Redux.

Q. What exactly is the Virtual DOM in React, and how does it function?

Ans:
The Virtual DOM is a lightweight copy of the actual DOM. React uses it to enhance performance by determining the difference between the Virtual DOM and the real DOM and updating only the specific elements that need changing.

Q. Define the concept of 'state' in React and its significance in managing components.

Ans:
State in React represents the internal data of a component. It allows components to manage and respond to changes, re-rendering when the state is updated. Here's a basic usage example:

```
class Counter extends React.Component {
  constructor(props) {
    super(props);
    this.state = { count: 0 };
  }
}
```

Q. Explain the purpose and role of 'props' in React components.

Ans:
Props (short for properties) are used to pass data from a parent to a child component. They're immutable and help in creating dynamic and reusable components.

```
function Greeting(props) {
  return <h1>Hello, {props.name}!</h1>;
}
```

Q. How can components be created in React?

Ans:
Components in React can be created as classes or functions. Classes extend React.Component, while functions are stateless components. Here's an example of both

```
class GreetingClass extends React.Component {
  render() {
    return <h1>Hello, from a class-based component!</h1>;
  }
}

const GreetingFunction = () => {
  return <h1>Hello, from a functional component!</h1>;
};
```

Q. Distinguish between an 'Element' and a 'Component' in React.

Ans:
Elements are the smallest building blocks in React, representing what you see on the screen. Components are composed of elements and manage their rendering and behavior.

Q. Elaborate on what JSX (JavaScript XML) is in the context of React.

Ans:
JSX is a syntax extension for JavaScript that allows writing HTML-like code in React. It simplifies the creation of React elements and improves readability. Example:

```
const element = <h1>Hello, JSX!</h1>;
```

Q. Describe the process of implementing conditional rendering in React.

Ans:
Conditional rendering involves showing different components or elements based on certain conditions. This is commonly achieved using the ternary operator or if statements in the render method. Example:

```
function Greeting(props) {
  return props.isLoggedIn ? <UserGreeting /> : <GuestGreeting />;
}
```

Q. What is the function of React Router, and how is it used in React applications?

Ans:
React Router is used for routing in React applications, enabling navigation and handling multiple views. It allows defining multiple routes and rendering different components based on the URL. Example:

```
<Router>
  <Route path="/home" component={Home} />
  <Route path="/about" component={About} />
</Router>
```

Q. Define Redux and outline the advantages of integrating it into a React application.

Ans
Redux is a state management library for JavaScript applications. It centralizes the state and provides predictable and easily testable code. Advantages include a single source of truth, easier debugging, and enhanced performance.

Q. What is your understanding of Redux Toolkit and how does it contribute to React development?

Ans:
Redux Toolkit is an official package that simplifies the use of Redux. It provides utilities, tools, and APIs to write concise, efficient, and maintainable code. It streamlines actions, reducers, and store setup.

Q. How would you explain the purpose of Axios and the benefits of using it over other libraries like Fetch or jQuery's Ajax?

Ans:
Axios is a promise-based HTTP client for making HTTP requests in the browser and Node.js. It offers advantages like interceptors, error handling, and easier-to-use syntax compared to Fetch or jQuery's Ajax.

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Q. Compare class-based components and functional components in React.

Ans:
Class-based components are traditional React components created using ES6 classes that extend React.Component. They have access to state, lifecycle methods, and class properties. In contrast, functional components are modern, using JavaScript functions to define the component. They are simpler and lean heavily on hooks to manage state and side effects. Class components have been used historically and are still in use for complex features, while functional components are now preferred for their simplicity and reusability.

Q. Define controlled and uncontrolled components in React.

Ans:
Controlled components are those where React controls the form elements and their values. They rely on the state within the component and use React to update and manage the form elements. Uncontrolled components, on the other hand, delegate control to the DOM. They store data within the DOM itself, often accessed through refs(a reference to DOM elements). Controlled components are usually recommended as they provide a single source of truth and are easier to test and maintain.

Q. What are Higher-Order Components?

Ans:
Higher-Order Components are a design pattern in React that allows you to reuse component logic. They are functions that take a component as an argument and return a new component with added props or behavior. HOCs help separate concerns, enhance code reusability, and provide a way to share code among components without repeating it. Common use cases include authentication, logging, and data fetching.

Q. Explain about types of side effects in React components.

Ans:
There are two types of side effects in React components. They are:

- **Effects without Cleanup:** This side effect will be used in useEffect which does not restrict the browser from screen update. It also improves the responsiveness of an application. A few common examples are network requests, Logging, manual DOM mutations, etc.
- **Effects with Cleanup:** Some of the Hook effects will require the cleanup after updating of DOM is done. For example, if you want to set up an external data source subscription, it requires cleaning up the memory else there might be a problem of memory leak. It is a known fact that React will carry out the cleanup of memory when the unmounting of components happens. But the effects will run for each render() method rather than for any specific method. Thus we can say that, before execution of the effects succeeding time the React will also clean up effects from the preceding render.

Q. What is a "key" prop and what is the significance of using it in arrays of elements?
Ans:
The "key" prop is a special attribute used in React to give elements a stable identity across renders. When you iterate over an array of elements and render them in a list, React uses the "key" to efficiently update the elements in the DOM. It helps React distinguish between items added, removed, or rearranged, which improves performance and reduces unnecessary re-rendering.

Q. Define the concept of Lifting State Up in React and its application.
Ans:
Lifting State Up is a pattern in React where you move the state from a child component to a common parent component. This allows multiple child components to share and update the same state. It's often used when sibling components need to communicate. By lifting state up, you create a single source of truth for the shared data, improving code maintainability and ensuring consistent data across components.

Q. How can styles be applied in React components?
Ans:
Inline Styles: Apply dynamic styles directly to JSX elements using JavaScript objects.

```
const divStyle = {
  color: 'blue',
  fontSize: '16px',
  border: '1px solid #ccc',
  padding: '10px'
};

return <div style={divStyle}>Styled Div</div>;
```

CSS Stylesheets: Create separate CSS files and use class names within components.

```
// styles.css
.styledDiv {
  color: blue;
  font-size: 16px;
  border: 1px solid #ccc;
  padding: 10px;
}

// Component file
return <div className="styledDiv">Styled Div</div>;
```

CSS Modules: Scoped styling approach using unique class names for components.

```
// styles.module.css
.styledDiv {
  color: blue;
  font-size: 16px;
  border: 1px solid #ccc;
  padding: 10px;
}

// Component file
import styles from './styles.module.css';

return <div className={styles.styledDiv}>Styled Div</div>;
```

CSS Frameworks: Bootstrap, Material-UI, and Tailwind CSS provide pre-designed components.

```
// Component file
return <div className="text-xl font-semibold">Styled Button</div>;
```

Q.What is the purpose of the useCallback hook?

Ans:
The useCallback hook in React is used to memoize functions, meaning it returns a memoized version of the callback function that only changes if one of the dependencies has changed. This is particularly useful in optimizing performance, especially in scenarios where functions are passed as props to child components.
Purpose of useCallback:-
useCallback prevents unnecessary renders by memoizing functions, ensuring they only change when their dependencies change. This optimization prevents the creation of new function references on each render, improving component performance, especially when relying on reference equality checks.

Q. Explain prop drilling in React and its impact.

Ans:
Prop drilling refers to the process of passing props down through multiple layers of nested components. It can make the code complex and less maintainable, as props need to be propagated through components that don't use them directly. To mitigate this issue, you can use context or state management solutions like Redux or React's Context API to share data without the need for prop drilling.

Q. How are events different in React?

Ans:
Events in React are synthetic and follow camelCase naming conventions, such as onClick instead of onclick. React's event system provides a consistent way to handle events across different browsers, ensuring that event handling remains predictable and compatible.

Q. What are the rules that must be followed while using React Hooks?

Ans:
When using React Hooks, you should follow certain rules:

- Hooks should be called at the top level of a functional component, not inside loops or conditions.
- Hooks are not permissible within conditional statements.
- Custom hooks should start with "use" to follow naming conventions.
- Only use hooks within React components, not in regular JavaScript functions.

Q. Explain the concept of store, actions, and reducers within Redux's architecture.

Ans:
In Redux, the "store" is a central container that holds the state of your application. "Actions" are plain JavaScript objects that describe changes to the state, and they are dispatched to the store. "Reducers" are functions that specify how the state should change in response to actions. They take the current state and an action and return to a new state. Reducers are pure functions, which means they don't modify the current state but create a new state object based on the action. Redux provides a predictable and centralized way to manage the state in complex applications.

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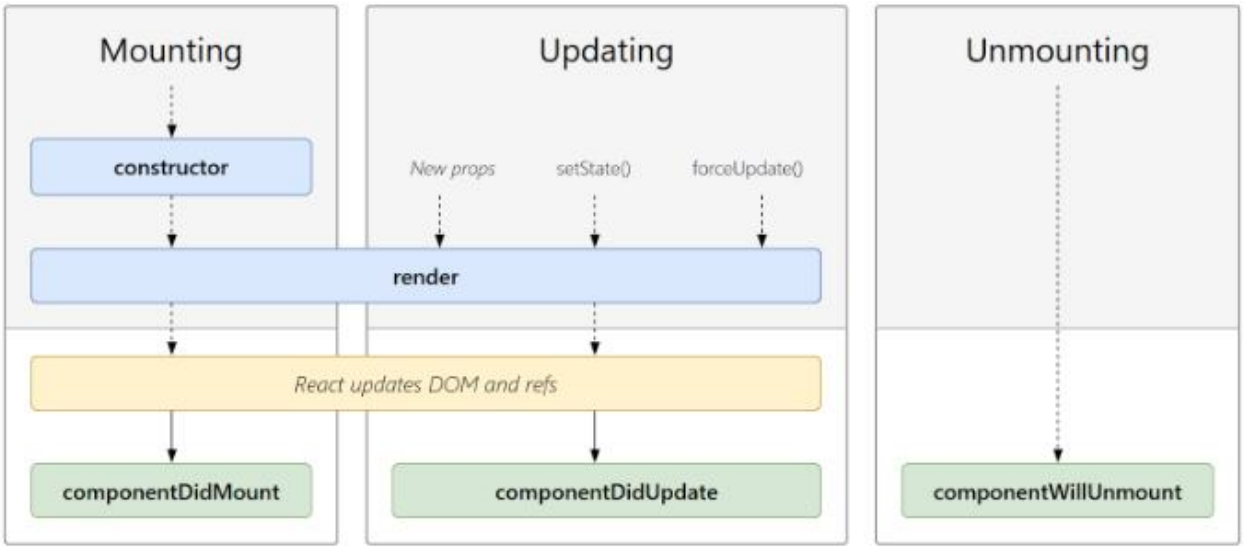
Q. What are the distinct phases in the component lifecycle in React?

Ans:
The component lifecycle in React encompasses several phases:

- **Mounting:** The component is created and inserted into the DOM.
- **Updating:** The component re-renders upon receiving new props or state changes.
- **Unmounting:** The component is removed from the DOM.

These phases consist of methods like componentDidMount, shouldComponentUpdate, componentDidUpdate, and componentWillUnmount.



Q. Elaborate on the purpose of the useEffect React Hook.

Ans:
useEffect is a Hook in React used for performing side effects in functional components. It serves as a replacement for lifecycle methods like componentDidMount, componentDidUpdate, and componentWillUnmount. It allows for managing side effects after rendering, and handling things like data fetching, subscriptions, or manual DOM manipulations.

Example:

```
import React, { useEffect, useState } from "react";

function ExampleComponent() {
  const [data, setData] = useState([]);

  useEffect(() => {
    // Perform data fetching or any other side effects
    fetch("https://api.example.com/data")
      .then((response) => response.json())
      .then((data) => setData(data));
  }, []); // Empty dependency array ensures the effect runs only once
}
```

Q. Define Context API in React.

Ans:
The Context API in React provides a way to pass data through the component tree without having to pass props manually at every level. It allows the creation of global data accessible by many components without explicitly passing props. This is particularly useful for sharing themes, user authentication, or language preferences across an application.

```
import React, { createContext, useContext } from "react";

// Create a context
const ThemeContext = createContext("light");

// Component consuming the context
const ThemedComponent = () => {
  // Access the context value
  const theme = useContext(ThemeContext);

  return (
    <div
      style={{
        background: theme === "dark" ? "#333" : "#fff",
        color: theme === "dark" ? "#fff" : "#333"
      }}
    >
      Theme: {theme}
    </div>
  );
};

// App component that provides the context
const App = () => {
  return (
    <ThemeContext.Provider value="dark">
      <ThemedComponent />
    </ThemeContext.Provider>
  );
};
```

Q. What is Reducer in React?

Ans:
In React, a reducer is a pure function responsible for specifying how the application's state changes in response to dispatched actions. It takes the current state and an action and returns a new state. Reducers are commonly used in tandem with context API and libraries like Redux to manage complex states in applications.

Q. Explain the use of refs in React and detail the concept of forward refs.

Ans:
Refs in React provide a way to directly access a DOM element or a React element created in the render method. They are often used for imperative DOM manipulations, focus management, or triggering animations. Forwarding refs allows passing a ref to a child component, facilitating direct access to its DOM element.

```
import React, { useRef } from 'react';

function TextInput() {
  const inputRef = useRef(null);

  function focusInput() {
    inputRef.current.focus();
  }

  return <input ref={inputRef} />;
}
```

Q. What is Strict Mode in React?

Ans:
Strict Mode is a tool in React used to highlight potential problems in an application. When enabled, it performs additional checks and warnings to help identify unsafe practices and potential bugs. It helps in identifying issues early in the development phase and encourages best practices for React components.

Q. List a few strategies or techniques for optimizing the performance of a React application.

Ans:

- **Using useMemo( ) and useCallback() - Caching CPU-Expensive Functions:**

Both hooks are designed to cache computationally expensive functions. In certain cases, a component might trigger costly calculations during re-renders, slowing down the rendering process. With useMemo(), these functions are memoized, meaning they're executed only when necessary, optimizing performance by preventing redundant recalculations. And the useCallback() hook that returns a memoized callback function. It's primarily used to optimize performance by memoizing event handlers or any other function instances that you don't want to recreate on every render.

- **Using React.PureComponent - Optimizing Component Renders:**

React.PureComponent is a base class that enhances performance by performing a shallow comparison of the component's state and props before triggering a render. Unlike the standard React.Component, which triggers a re-render on any state or prop change, PureComponent only re-renders if changes are detected. This reduces unnecessary renders, optimizing the app's performance.

- **Maintaining State Colocation - Improving Readability and Performance:**

State colocation involves strategically placing state as close as possible to where it's used in React components. When a parent component holds excessive states, the code becomes less manageable and leads to unnecessary re-renders. It's beneficial to relocate less critical states to separate components, improving code readability and reducing rendering overhead.

- **Lazy Loading - Enhancing React App Load Times:**

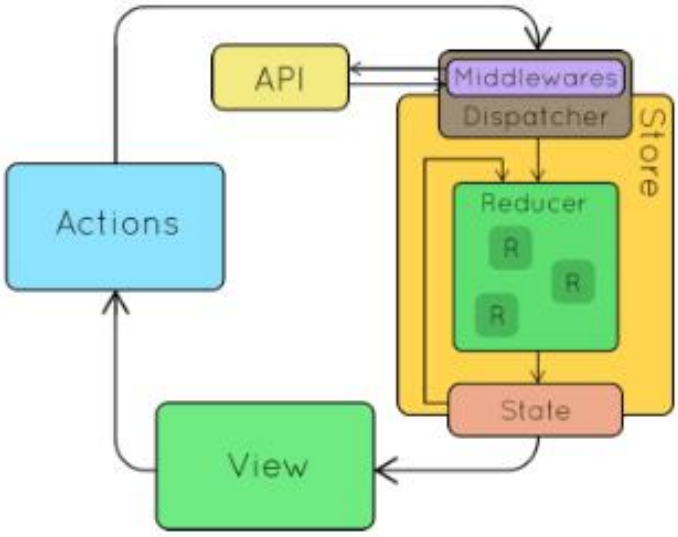
Lazy loading is a technique vital for enhancing the load time of a React application. By employing lazy loading, parts of the application are loaded only when required, minimizing the initial load time. This significantly contributes to improving the overall performance of web applications by reducing unnecessary data loading upfront and optimizing the user experience.

Q. Describe the typical data flow within an application developed using React and Redux, outlining the Redux Lifecycle for such applications.

Ans:

In an application using React and Redux, the typical data flow involves:

- **Action Dispatch:** Components dispatch actions.
- **Reducers:** Actions are processed by reducers, updating the state.
- **Store Update:** The store holds the updated state.
- **Re-render:** Components subscribed to the store re-render based on the updated state.



Q. How can Axios interceptors be utilized to include headers or manage authentication tokens in request handling? Could you provide an example code for implementing one?

Ans:
Axios interceptors are useful for modifying HTTP request configurations globally. They provide a way to intercept and alter requests or responses before they are handled by the application. Here's an example of using Axios interceptors to include headers or manage authentication tokens:

```
import axios from "axios";

// Create an instance of Axios
const instance = axios.create({
  baseURL: "https://api.example.com"
});

// Add a request interceptor to include headers or tokens
instance.interceptors.request.use(
  (config) => {
    // Modify the request configuration, e.g., adding headers
    config.headers.Authorization = `Bearer ${localStorage.getItem("accessToken")}`;
    return config;
  },
  (error) => {
    return Promise.reject(error);
  }
);

// Use the Axios instance to make requests
instance
  .get("/data")
  .then((response) => {
    // Handle response data
  })
  .catch((error) => {
    // Handle error
  });
```

Q. How would you manage timeouts and retries using Axios when dealing with a slow or unreliable API?

Ans:

To handle timeouts and retries with Axios when dealing with a slow or unreliable API, you can utilize Axios' configuration options:

- Timeouts: Set a timeout duration for the requests using the timeout configuration option. If the request takes longer than the specified time, Axios will throw an error.

```
axios
  .get("/api/data", { timeout: 5000 })
  .then((response) => {
    // Handle response
  })
  .catch((error) => {
    // Handle timeout error
  });
```

- **Retries:** For retries, you can implement error handling to resend the request upon specific error conditions, using Axios' error response.

Q. Explain the procedure for setting custom request headers and associating them with specific Axios instances.

Ans:
To set custom request headers for a specific Axios instance, you can use the axios.create() method to create an instance and set the headers as default configuration.

```
const instance = axios.create({
  baseURL: "https://api.example.com",
  headers: {
    "Content-Type": "application/json",
    Authorization: "Bearer your_token_here"
  }
});

instance
  .get("/endpoint")
  .then((response) => {
    // Handle response
  })
  .catch((error) => {
    // Handle error
  });
```

Q. Discuss the role of Content-Type headers in Axios requests and demonstrate how various types can be set within Axios configuration.

Ans:
Content-Type headers are crucial in Axios requests as they define the type of data being sent. Axios allows you to set different Content-Type headers based on the type of data you're sending:

Example 1: Setting Content-Type: application/JSON:

```
axios.post(
  "/api/data",
  { data: "your_data_here" },
  {
    headers: {
      "Content-Type": "application/json"
    }
  }
);
```

Example 2: Setting Content-Type: multipart/form-data for File Uploads:

```
const formData = new FormData();
formData.append("file", file);

axios.post("/api/upload", formData, {
  headers: {
    "Content-Type": "multipart/form-data"
  }
});
```

Ensure that the Content-Type header is correctly set based on the type of data being sent to the server to ensure proper interpretation and processing on the server side.