Video: Crude - The Incredible Journey of Oil
Student Worksheet

Documentary: Crude – The Incredible Journey of Oil
Duration: 89 minutes

Overview of the Documentary

At a time of peaking fuel prices, Dr Richard Smith explores the history of one of our most contentious commodities. "Crude" is internationally acclaimed and has won more than 12 film awards, including the coveted Earth Sciences category at Jackson Hole and the Walter Sullivan Medal for Science Journalism for the American Geophysical Union, the world's largest professional association of Earth scientists.

Questions

1. **Identify** the source of oil.

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   _____
   _____

2. **Describe** the importance of carbon to life.

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   _____
   _____

3. **Identify** how much carbon is locked up in living organisms.

   _____

4. **Identify** the large geological sinks of carbon locked away deep underground.

   _____

5. **Explain** the release of large volumes of carbon dioxide in the mid Jurassic.

   _____
   _____

6. **Explain** how carbon dioxide acts to regulate the Earth's temperature.

   _____
   _____
   _____

7. **Describe** the Earth during the mid Jurassic.

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_____
_____
_____
_____
_____

8. **Describe** the journey and timeline of a carbon dioxide molecule from how long it is in the atmosphere to when it enters a Gingko tree until it is released back into the atmosphere.

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_____
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9. **Identify** the process that phytoplankton uses to harvest carbon dioxide.

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10. **Describe** the result of nitrogen and phosphorus pollution from the Mississippi River in the Gulf of Mexico.

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11. **Describe** how anoxic stagnant dead zones in the ocean lead to black ooze and future oil deposits.

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12. **Describe** the geology of the Dorset 'Jurassic' coast of Southern England and its formation.

13. **Describe** the conditions required to produce oil and natural gas deposits.

14. **Identify** the special conditions that are needed for large oil reservoirs to form.

15. **Identify** what drove the first global demand for oil.

16. **Identify** the main use for gasoline, a kerosene production waste product.

17. **Identify** the products refined from crude oil.

18. **Describe** the Gwahar Oil Field and what makes it unique.

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_____

19. **Identify** when Peak Oil was reached in the USA.

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_____

20. **Identify** when global Peak Oil was predicted to be reached by Hubbert.

_____

_____

21. **Describe** what it means to be on the other side of Peak Oil and what this means for oil prices in the future.

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_____

22. **Identify** how many barrels of oil are transported and burnt every day.

_____

_____

23. **Identify** the consequences of burning fossil fuels, like oil.

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_____

24. **Identify** the conditions each super anoxic oceanic event has been linked to.

_____

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_____

25. **Identify** what each period of super Greenhouse climate has been correlated to.

_____

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26. **Identify** the relationship between the number of pores in fossil Gingko leaves and atmospheric levels of carbon dioxide.

_____

_____

27. **Describe** the effects of rising temperatures.

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_____

28. **Identify** how rain was different in the Jurassic to rain today and the effects it would have had.

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29. **Describe** the effects of increased sediments and nutrients in the oceans.

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_____

30. **Describe** the conditions required to transfer oxygen into the deep sea.

_____

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_____

31. **Identify** the toxic chemical released in anoxic ocean environments and the consequences.

_____

_____

_____

32. **Identify** the organisms that can survive in the anoxic conditions of Green Lake.

_____

33. **Describe** how the Earth recovers from super Greenhouse conditions.

_____

_____

_____

34. **Identify** three effects of excess carbon burial and resetting the global thermostat.

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_____
_____

35. **Describe** how the loss of polar ice can amplify global warming.

_____
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Complete the passage below based on your answers to the questions above.

Molecules of carbon dioxide were released in huge volumes by _____ eruptions in the mid Jurassic. Carbon dioxide helps to regulate the Earth's _____. Too little carbon dioxide in the atmosphere and the Earth _____, too much and the Earth _____. The time of the dinosaurs was one of the _____ in Geological history with Super Greenhouse conditions.
Carbon dioxide in the ocean is absorbed during photosynthesis by _____. When these organisms die, they transport the carbon locked in their tissues to the deep ocean. If conditions are _____ then nothing decays, and large volumes of black ooze build up on the ocean floor. If conditions are favourable then this black ooze will form black shale and potentially oil.
To form large oil reserves several special conditions are needed:

1. Rich source rocks high in carbon
2. Source rocks _____ to the right temperature underground
3. Excellent reservoir rocks that are porous and permeable
4. _____ cap rocks that trap the oil
5. Anticline (or other structure) for the oil deposit to collect and sit in.

Oil is used for transportation and in the _____ industry which underpins almost everything in our modern lives. Burning oil releases carbon dioxide into the _____. This leads to global _____ and _____ climate conditions.

In the Jurassic Super Greenhouse conditions would have led to more _____ and extreme weather. The rain was more _____ than it is today. This led to increased weathering and erosion which released sediments and _____ into the oceans. This led to phytoplankton blooms and the depletion of _____ in the ocean. This led to the production of hydrogen sulfide which is _____ to most lifeforms.
Oceanic anoxic events lead to high levels of purple and green sulfur bacteria and Archaea that use hydrogen sulfide. This leads to perfect conditions for large reservoirs of undecayed organisms to accumulate and extinction events. Burying the carbon contained in dead organisms creates a carbon _____, locking away the carbon in source rocks. This _____ the amount of carbon dioxide in the atmosphere and leads to global _____. This leads to a drop in sea temperatures, sea _____ and the formation of _____ at the poles.
Increasing water temperatures in the oceans leads to the slowing or halting of oceanic _____. Increased temperatures also lead to sea level _____, melting of _____ and increased surface temperatures. This leads to less dissolved _____ and areas of anoxic conditions in the deep oceans, which may trigger a Super Greenhouse event, like in the Jurassic, and the formation of new oil deposits in the future.