



Tutorial 4

Travelling Light



TMA 4

- Sources and impacts of CO₂, SO₂ & NO_x
- Environmental impacts of steel production
- Cars
 - Kinetic energy
 - Effect of design on fuel consumption
- Report on travel (**60%** of marks)



Finding Information

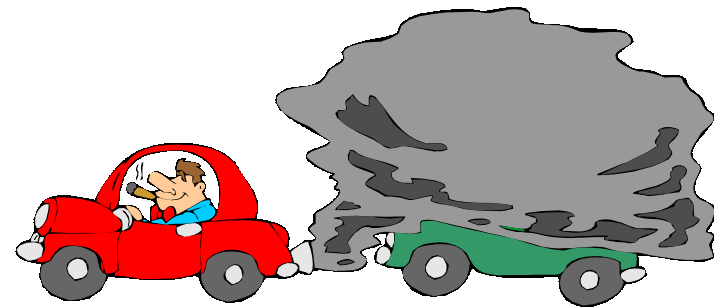
- Use course glossary / index
- Be selective





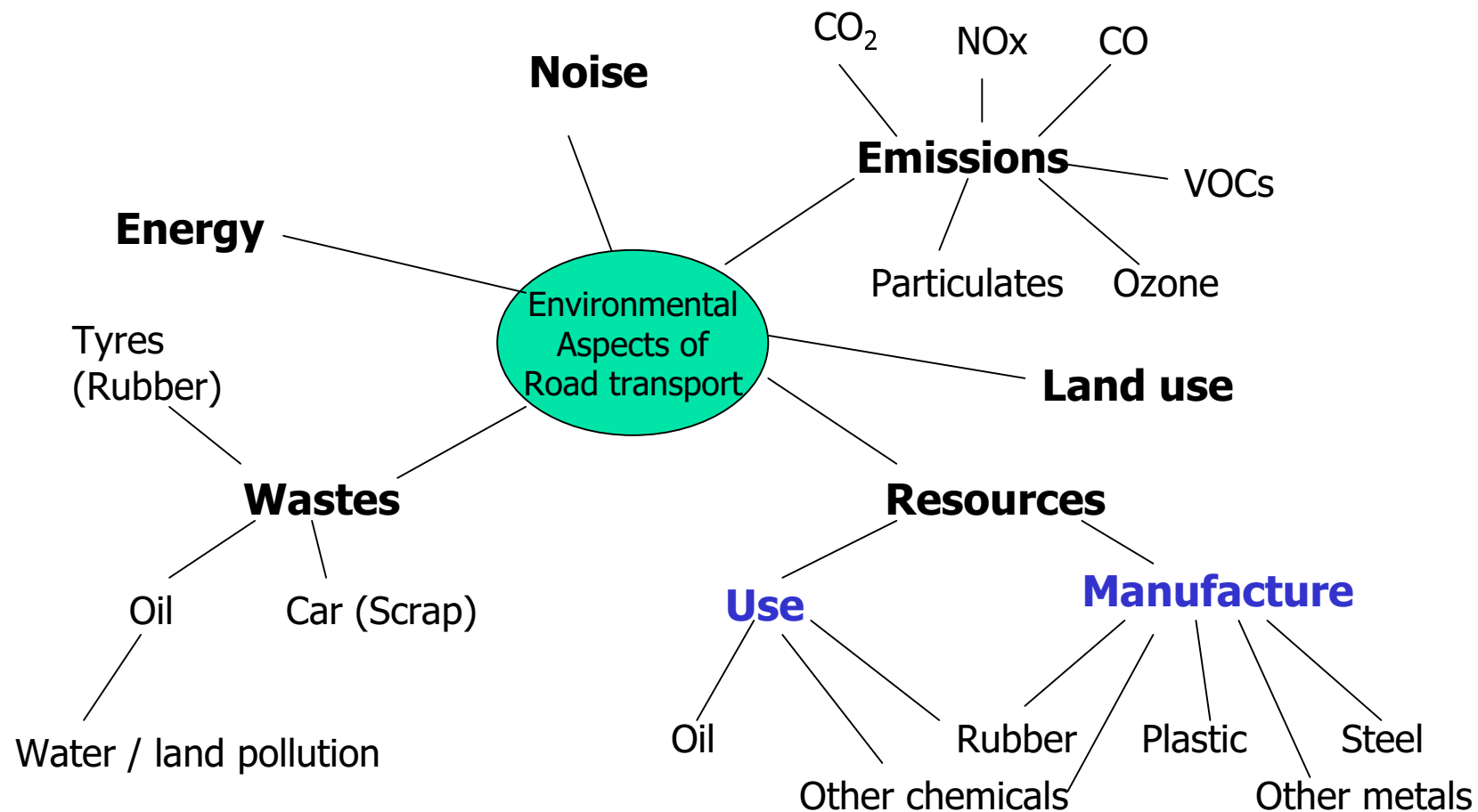
Exercise

- What are the environmental impacts of road transport?



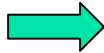
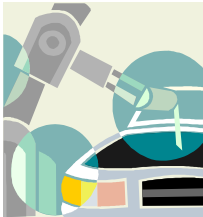


Spray Diagram

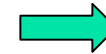
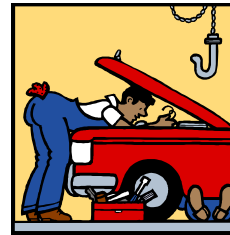


Life Cycle Assessment

Manufacture



Use

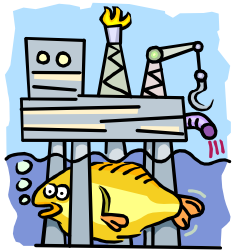


Disposal

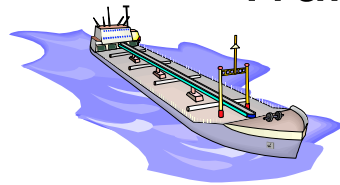


Examines environmental impacts which occur
“from cradle to grave”

Life Cycle Assessment - Petrol



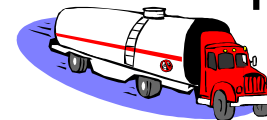
Extraction of oil



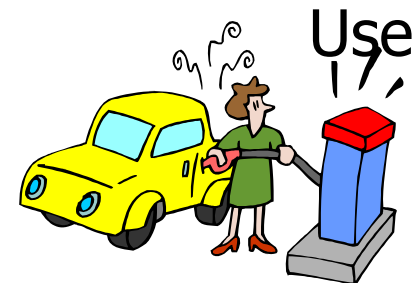
Transport of oil



Refining



Transport





Calculation

- A car weighs 1600 kg. The driver weighs 80 kg. What is its kinetic energy when driven at 90 km hr^{-1} ?



Answer

- Kinetic energy = $0.5 m v^2$
- Where
 - m = mass (kg) and
 - v = velocity (m/s)
- First convert velocity in km/hr to m/s
 - Divide by no. of seconds in 1 hour (3600)
 - Multiply by no. of metres in a km (1000)
 - So $90 \text{ km/hr} = \frac{90 \times 1000}{3600} = 25 \text{ m/s}$



Answer (continued)

- Total mass = 1600 kg + 80 kg = 1680 kg
- So kinetic energy = $0.5 \times 1680 \times 25^2$
= 525000 J
= **5.25×10^5 J**, or
= **525 kJ**



Exercise

- I traveled to Chester (80 mile round trip) five times by car.
 1. How much energy did I use?
 2. How much CO₂ did I generate?



Answer – Q1

- Total distance travelled was 400 miles
 - $400 \text{ miles} = 400 \text{ miles} \times 1.6 \text{ km mile}^{-1}$
 $= 640 \text{ km}$
- From Table 3.4 in Theme 2
 - Average car consumes 3.5 MJ km^{-1}
- Energy consumed
 - $= 640 \text{ km} \times 3.5 \text{ MJ km}^{-1}$
 - $= \mathbf{2240 \text{ MJ}}$



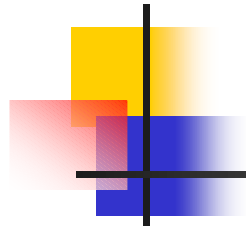
Answer – Q2

- Total distance travelled was 400 miles
 - $400 \text{ miles} = 400 \text{ miles} \times 1.6 \text{ km mile}^{-1} = 640 \text{ km}$
- From Table 4.2 in Theme 2
 - Average figure for petrol car is $385 \text{ gm CO}_2 \text{ km}^{-1}$
- Energy consumed
 - = $640 \text{ km} \times 385 \text{ gm CO}_2 \text{ km}^{-1}$
 - = **246400 gm**
 - = **246.4 kg**
 - (note that this is equivalent to 0.25 tonnes!)

Minimising Our Impact on the Environment

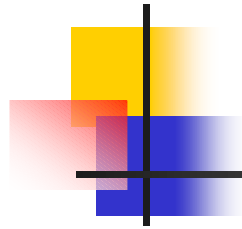
- Prevention
- Technical measures
- Administrative measures





Exercise

- What measures can we consider to reduce the environmental impacts of road travel?



Report of Travel

1. Analyse **your** travel *14 marks*
2. Assess information collected *8 marks*
3. Develop 5 year plan to reduce **your** CO₂ emissions *25 marks*
4. Discuss the viability of your plan
10 marks

3 marks for presentation

(Total of 60 marks)



Report Writing

- See guidance (on web site)



Some tips

- Stage 1
 - Use table to present data
 - For energy use see Table 3.4 in Theme 2
- Stage 2
 - Identify and **explain**
- Stage 3
 - Should be based on your own travel
 - Option b available if your road travel is minimal



Some tips (continued)

- Stage 4
 - Pros and cons
 - Strengths and weaknesses
 - Who needs to do what