Smoking and biological harm

Student activity • observation and reasoning

YEAR 10 / LESSON 57 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

How can tobacco smoke affect gas exchange and circulation?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, pencil and ruler
- Teacher-provided airway and alveolus diagrams; linked NHS background summary

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 2.49. Smoking and health.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Use diagrams and published evidence only; no tobacco, smoke generation or personal smoking survey is used.

2. Link damage to cilia with reduced mucus clearance and increased risk of respiratory problems.

3. Explain how damage to alveolar walls reduces gas-exchange area and elastic recoil.

4. Distinguish nicotine's addictive and cardiovascular effects from carbon monoxide binding to haemoglobin and reducing oxygen carriage.

5. Link smoke exposure with cancer risk and damage to blood vessels, including coronary disease; distinguish increased risk from certainty for an individual.

6. Plan how to evaluate an observational study: specify the exposure and outcome, sample size, follow-up period and possible confounders you would need to inspect. Distinguish this appraisal plan from analysing an actual dataset.

Cleanup

- Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Tobacco smoke contains multiple harmful substances. Carbon monoxide reduces the blood's capacity to carry oxygen; nicotine is addictive and can increase cardiovascular workload. Smoke damages airways and contributes to cancer and cardiovascular disease. Population evidence does not predict an individual's outcome with certainty.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. How can ciliary damage matter?

2. What happens when alveolar walls are lost?

3. What does carbon monoxide do to oxygen carriage?

4. What is nicotine’s key role in dependence?

5. Does increased risk mean every exposed person develops disease?

6. Why consider confounding in a study?