

GCSE Biology B (Twenty First Century Science)
J257/04 Depth in biology (Higher Tier)

Question Set 10

1 Smoking cigarettes is linked to lung cancer.

(a) The National Health Service (NHS) in England helped 196 000 people who wanted to stop smoking in 2017.

(i) After using the NHS, 98 000 of these people told their doctor they had stopped smoking.

What percentage of the people who used the NHS said they had stopped smoking?

$$\frac{98\,000}{196\,000} \times 100 = 50\%$$

Percentage of people = 50 % [1]

(ii) Doctors tested the breath of all the people who said they had stopped smoking.

The tests showed that 72% of these people really had stopped smoking.

How many people had successfully stopped smoking?

$$98\,000 \times \frac{72}{100} = 70\,560$$

Number of people = 70560 people [1]

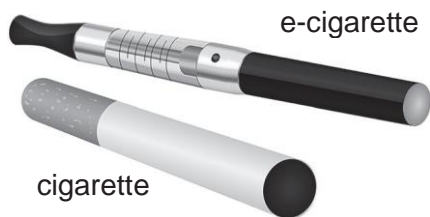
(b) Cigarette smoke contains carcinogens.

Carcinogens are substances that can cause mutations in a cell's DNA.

Explain how this can lead to cancer.

Mutations may cause cells to divide more frequently and cell division become uncontrollable. These mutated cells could metastasise and cause development of secondary malignant growth. This leads to cancer. [3]

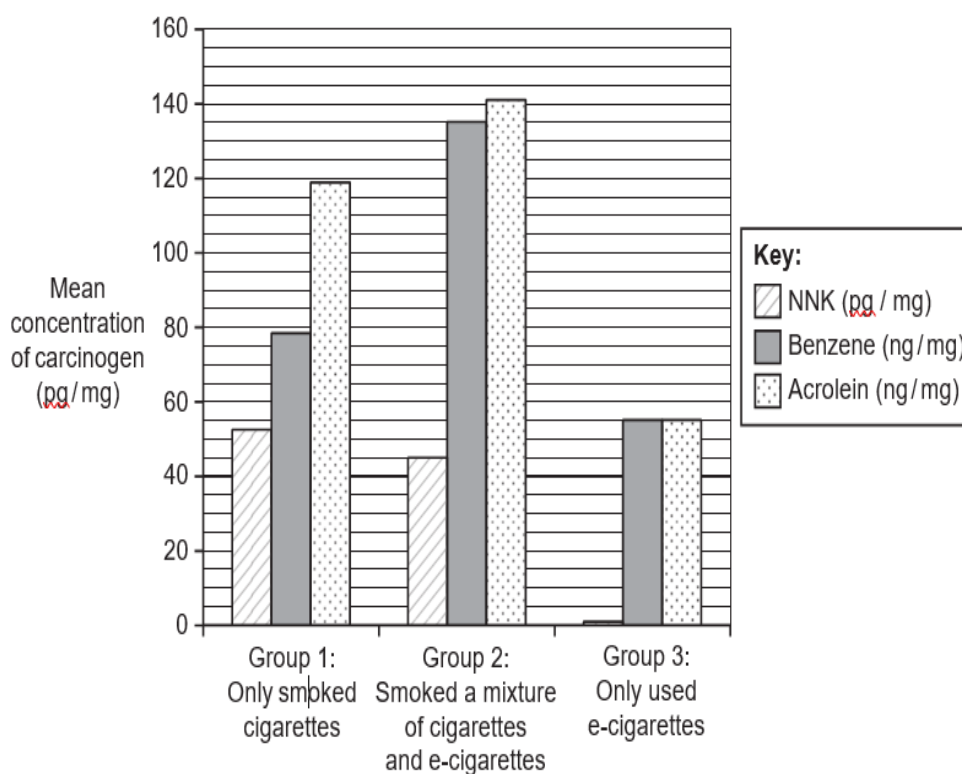
- (c) Some people who want to stop smoking cigarettes start using e-cigarettes (vaping) instead.



Cigarette smoke and e-cigarette vapour both contain carcinogens called NNK, benzene and acrolein.

Scientists measured the concentrations of these carcinogens in the saliva and urine of three groups of people. The groups had behaved in different ways for six months.

The results are shown in the bar chart.



- (i) The mean concentration of NNK for Group 1 was 53 pg/mg. The mean concentration of NNK for Group 3 was 1 pg/mg.

Calculate the percentage change in the mean concentration of NNK in Group 3 compared to Group 1.

$$\frac{53 - 1}{53} \times 100$$

Percentage change = $(-)$ 98 % [2]

(ii) Read the news headline:

E-cigarettes 98% safer than cigarettes

Do you agree with the headline? Explain your answer.

No because only the level of NNK decreased by 98%. The other carcinogens are decreased less than 98% [2]

(iii)* Beth is worried because her mother and sister both died from lung cancer.

She plans to reduce the number of cigarettes she smokes and she will use an e-cigarette the rest of the time.

Describe the factors that affect Beth's risk of developing lung cancer and explain the best course of action for her. [6]

Risk factors are smoking any kind of cigarettes, radiation therapy, ^{age} and family history of lung cancer. She should quit smoking any kind of cigarettes, including e-cigarettes to reduce her risk even further. Because smoking is the biggest risk factor for lung cancer.

E-cigarettes still contain carcinogen thus can cause lung cancer like cigarettes.

- > (Older age reflects cell DNA damage accumulating over time e.g. in lung cells)
- > (Cigarettes and radiation therapy cause DNA in the lung cell to mutate and cause lung cancer)
- > (If members of Beth's family developed lung cancer, it is likely that Beth has genes / alleles that increase the chance of having lung cancer)

Total Marks for Question Set 10: 15



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