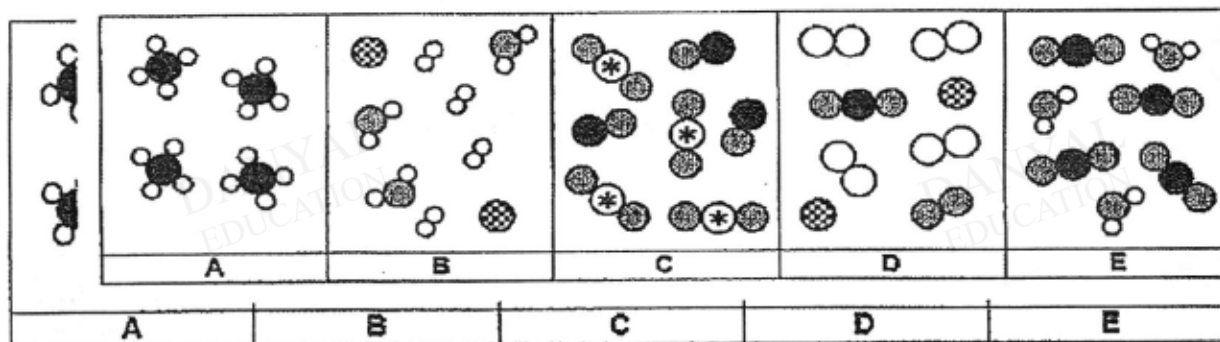


**O Level Combined Chemistry Structured**

**Atmosphere Test 1.0**

Q1

- 1 The diagrams A, B, C, D and E represent the particles in five different substances. Each type of atom for the particle is represented by a different symbol.



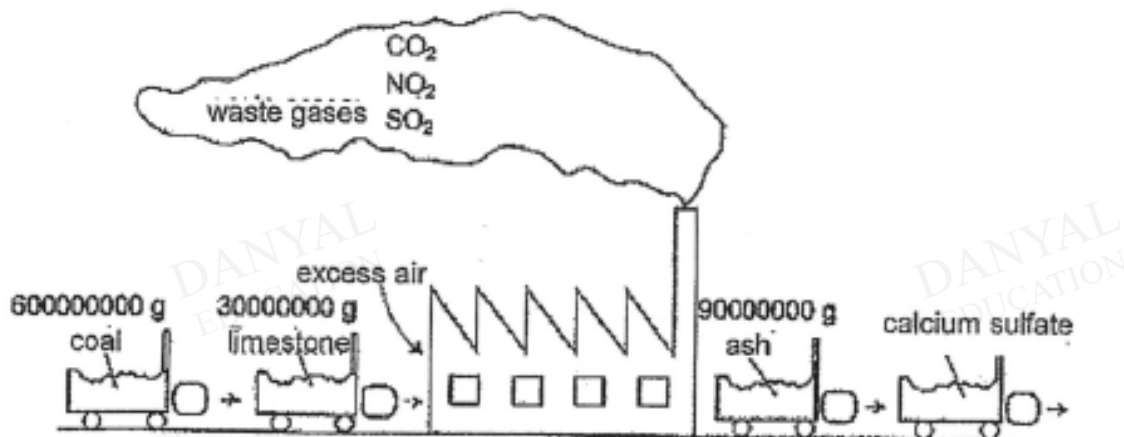
once. Which one of the diagrams A, B, C, D and E best represents

- (a) a mixture of compounds formed when methane is burnt with plenty of oxygen, .....
- (b) a mixture of two elements and a compound, .....
- (c) molecules of methane, .....
- (d) a mixture of gases found in unpolluted air, .....
- (e) a mixture of pollutants? .....

[5]

Q2

Some power stations use coal as fuel. Coal contains sulfur impurities. On combustion, sulfur is oxidized to sulfur dioxide. Before the waste gases are released into the atmosphere, the sulfur dioxide is removed by limestone. The diagram shows the amounts of substances used and produced by a coal-fired power station in a day.



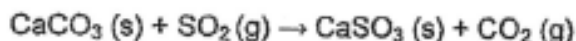
- (a) Write a balanced chemical equation for the combustion of sulfur to sulfur dioxide.

.....  
 [1]

- (b) State a harmful effect of sulfur dioxide.

.....  
 [1]

- (c) Limestone removes sulfur dioxide from the waste gases, as shown in the equation below.



Calculate the maximum volume of carbon dioxide produced from 30,000,000 g (30 tonnes) of limestone.

.....  
 [3]

- (d) When the limestone was first used in the power stations, some scientists claimed they 'solved all pollution problems at the power stations'.

Explain why this is not true.

.....  
 [2]

Q3

Explain why

(a) not recycling plastics can cause pollution,

.....  
..... [1]

(b) the incomplete combustion of hydrocarbons can be dangerous to people,

.....  
..... [1]

(c) the combustion of fossil fuels can harm aquatic life.

.....  
..... [1]

[Total: 3]

Q4

The nitrogen dioxide gas produced is an air pollutant which is also formed in car engines.

(i) Explain, with suitable chemical equations, how nitrogen dioxide is formed in a car engine. [2]

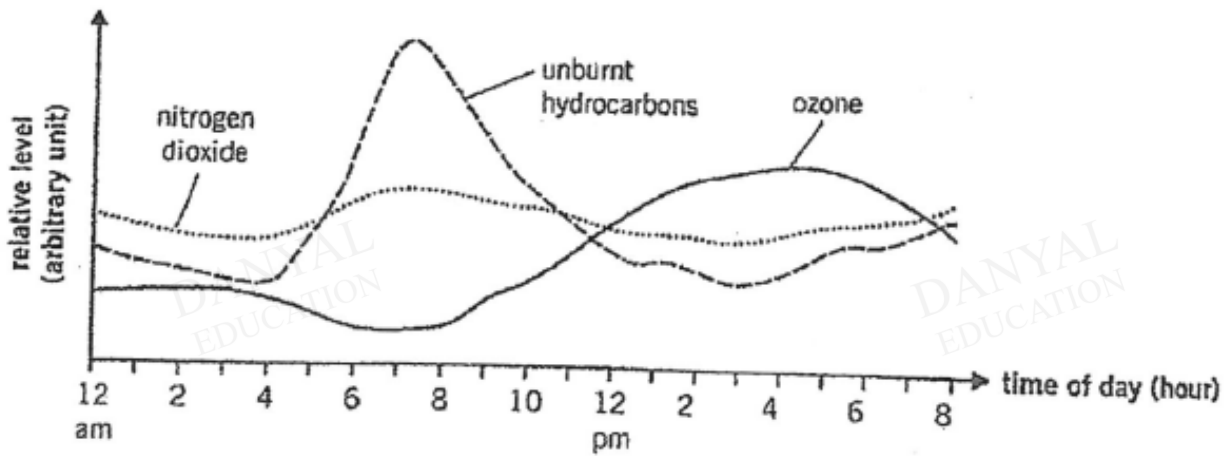
.....  
.....  
.....  
.....

(ii) State two harmful effects of nitrogen dioxide, one on health and one on the environment. [2]

.....  
.....  
.....

Q5

The graph below shows the relative levels of three air pollutants on the major traffic roads of a city measured over a period of 20 hours on a particular day.



(a) What could be the source of nitrogen dioxide that is shown in this graph?

.....  
.....  
.....

[1]

(b) Suggest a possible reason for the high concentration of unburnt hydrocarbons between 6 am and 10 am?

.....  
.....  
.....

[1]

(c) Describe one harmful effect of nitrogen dioxide to the environment.

.....  
.....  
.....  
.....

[2]

**Answers**

**Atmosphere Test 1.0**

Q1

<b>1a</b>	<b>E</b>
<b>b</b>	<b>B</b>
<b>c</b>	<b>A</b>
<b>d</b>	<b>D</b>
<b>e</b>	<b>C</b>

Q2

<b>7a</b>	$S + O_2 \rightarrow SO_2$
<b>b</b>	Formation of acid rain, which destroys buildings and kill plants/eyes Irritation/breathing difficulties
<b>c</b>	<p>No. of moles of <math>CaCO_3 = \frac{30000000}{40 + 12 + (16 \times 3)} = 300000 \text{ mol}</math></p> <p>From eqn,                      1 mole <math>CaCO_3</math> produces 1 mole of <math>CO_2</math>                      300000 moles <math>CaCO_3</math> produce 300000 moles <math>CO_2</math></p> <p>Volume of <math>CO_2 = 300000 \times 24 \text{ dm}^3 = 7200000 \text{ dm}^3</math></p>
<b>d</b>	Carbon dioxide is produced which causes global warming. Nitrogen dioxide is produced which causes acid rain.

Q3

(a)	Burning plastics releases toxic gases which causes air pollution; Improper disposal of plastics can cause water and land pollution.	[1] for any one suitable answer
(b)	Carbon monoxide produced reacts with haemoglobin in blood to form carboxyhaemoglobin, which reduces the ability of haemoglobin to transport oxygen; Carbon monoxide causes breathing difficulties and death.	[1] for any one suitable answer
(c)	Sulfur dioxide produced reacts with water to form acid rain, causing water bodies to become too acidic hence harm aquatic life.	[1]

Q4

(i) At high temperatures, nitrogen combines with oxygen to form nitrogen monoxide  
$$\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g}) \quad [1]$$

Nitrogen monoxide reacts with oxygen to produce nitrogen dioxide  
$$2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}_2(\text{g}) \quad [1]$$

- (ii) - Causes eye and lung irritation / inflammation of the lungs / breathing difficulties  
- Combines with oxygen and rainwater to acid rain, corroding buildings and harming aquatic life  
[Any 2 – 1 mark each]

Q5

(a)	<u>Oxygen and nitrogen from the air reacts under high temperature in the car combustion engines.</u>	[1]
(b)	<u>Between 6 am to 10 am, there is a lot of people commute to work using vehicles therefore high level of unburnt hydrocarbons are produced from these vehicles.</u>	[1]
(c)	<u>Nitrogen dioxide in the air reacts with oxygen and water to form nitric acid. The nitric acid dissolves in rainwater forming acid rain which harms aquatic animals / destroy plant growth / corrodes buildings and objects made of limestone / steel. (anyone)</u>	[1/2] [1/2] [1]