

1. **June/2023/Paper_0620/11/No.29**

Several processes are used to treat domestic water.

Which row identifies a reason for the given process?

	process	reason
A	chlorination	removes impurities
B	filtration	removes insoluble solids
C	sedimentation	removes soluble solids
D	use of carbon	kills bacteria

2. **June/2023/Paper_0620/11/No.30**

Which pair of compounds make an NPK fertiliser?

- A** ammonium sulfate and potassium phosphate
- B** calcium hydroxide and ammonium nitrate
- C** calcium phosphate and potassium chloride
- D** potassium nitrate and ammonium sulfate

3. **June/2023/Paper_0620/11/No.31**

Some information about gas X is listed.

- It is not present in clean, dry air.
- It is not a cause of respiratory problems.
- It is responsible for global warming.

What is X?

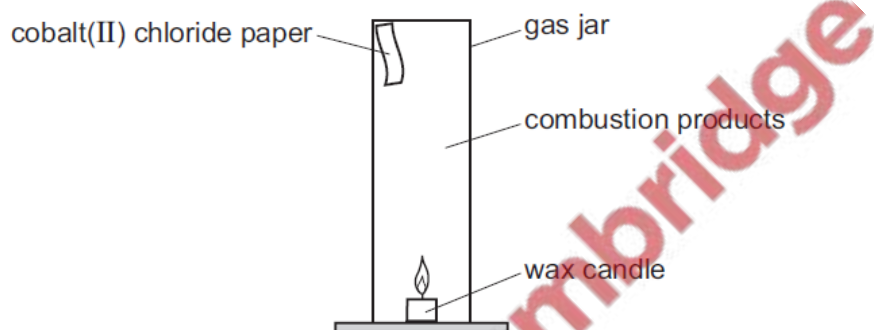
- A** carbon dioxide
- B** carbon monoxide
- C** methane
- D** nitrogen dioxide

4. June/2023/Paper_0620/12/No.25
Which compounds **both** contribute to acid rain?

- A carbon monoxide and carbon dioxide
- B carbon monoxide and oxides of nitrogen
- C oxides of nitrogen and sulfur dioxide
- D sulfur dioxide and carbon dioxide

5. June/2023/Paper_0620/12/No.29
A wax candle is made from a mixture of hydrocarbons.

The candle is lit and placed in a gas jar along with a strip of cobalt(II) chloride test paper as shown.



After a short time, the oxygen in the jar is used up and the candle flame goes out.

Which substance does the cobalt(II) chloride paper identify?

- A carbon dioxide
- B carbon monoxide
- C sulfur dioxide
- D water

6. June/2023/Paper_0620/12/No.30
Urea, $\text{CO}(\text{NH}_2)_2$, is used as a fertiliser.

Which element that plants need for improved plant growth is provided by urea?

- A carbon
- B hydrogen
- C nitrogen
- D oxygen

7. June/2023/Paper_0620/12/No.31

The percentage composition of gases on Neptune is shown.

gas	percentage composition / %
hydrogen	80
helium	18
methane	1.5
other gases	0.5

Which statement about the atmospheres on Neptune and on the Earth is correct?

- A There is more helium on Neptune than oxygen on the Earth.
- B There is less methane on Neptune than carbon dioxide on the Earth.
- C There is less hydrogen on the Earth than on Neptune.
- D There is more helium on the Earth than on Neptune.

8. June/2023/Paper_0620/13/No.25

Water from a reservoir flows to the water works where purification process 1 takes place followed by process 2.

What are processes 1 and 2?

	process 1	process 2
A	chlorination	filtration
B	filtration	chlorination
C	fractional distillation	filtration
D	filtration	fractional distillation

9. June/2023/Paper_0620/13/No.29

Which statements about water are correct?

- 1 Tap water has fewer impurities than distilled water.
- 2 Tap water will turn anhydrous cobalt(II) chloride pink.
- 3 The domestic water supply is treated with carbon to kill microbes.
- 4 Phosphates from fertilisers can cause deoxygenation of water.

- A 1 and 2
- B 1 and 3
- C 2 and 4
- D 3 and 4

10. June/2023/Paper_0620/13/No.30

Which substance is used by farmers to improve plant growth?

- A ammonium nitrate
- B phosphoric acid
- C potassium
- D sodium oxide

11. June/2023/Paper_0620/13/No.31

Three air pollutants, X, Y and Z, are described.

X is a toxic gas formed by the incomplete combustion of an alkane.

Y is formed by decomposing vegetation and increases global warming.

Z is a cause of breathing problems and acid rain.

Which pollutants are X, Y and Z?

	X	Y	Z
A	carbon monoxide	methane	oxides of nitrogen
B	carbon monoxide	particulates	carbon dioxide
C	sulfur dioxide	methane	oxides of nitrogen
D	sulfur dioxide	particulates	carbon dioxide

12. June/2023/Paper_0620/21/No.29

Several processes are used to treat domestic water.

Which row identifies a reason for the given process?

	process	reason
A	chlorination	removes impurities
B	filtration	removes insoluble solids
C	sedimentation	removes soluble solids
D	use of carbon	kills bacteria

13. June/2023/Paper_0620/21/No.30

What is the equation for photosynthesis?

- A $\text{CO}_2 + 3\text{H}_2 \rightarrow \text{CH}_3\text{OH} + \text{H}_2\text{O}$
- B $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- C $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$
- D $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$

14. June/2023/Paper_0620/21/No.31

Which statement describes how the C–H bonds in methane gas in the atmosphere contribute to global warming?

- A They absorb thermal energy from the Sun and emit some of this energy into space.
- B They absorb thermal energy from the Sun and emit all of this energy towards the Earth.
- C They absorb thermal energy from the Earth and emit all of this energy towards the Earth.
- D They absorb thermal energy from the Earth and emit some of this energy towards the Earth.

15. June/2023/Paper_0620/22/No.25

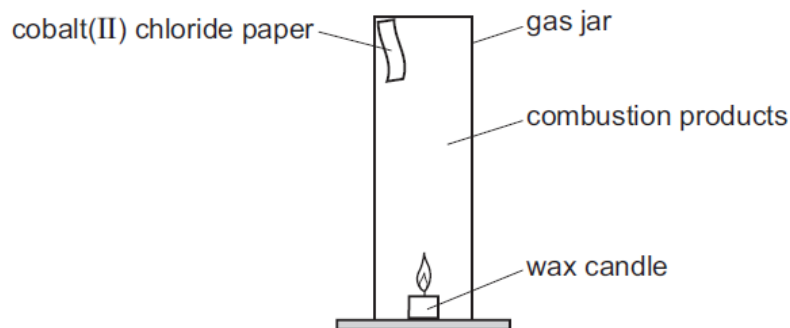
Which compounds **both** contribute to acid rain?

- A carbon monoxide and carbon dioxide
- B carbon monoxide and oxides of nitrogen
- C oxides of nitrogen and sulfur dioxide
- D sulfur dioxide and carbon dioxide

16. June/2023/Paper_0620/22/No.29

A wax candle is made from a mixture of hydrocarbons.

The candle is lit and placed in a gas jar along with a strip of cobalt(II) chloride test paper as shown.



After a short time, the oxygen in the jar is used up and the candle flame goes out.

Which substance does the cobalt(II) chloride paper identify?

- A carbon dioxide
- B carbon monoxide
- C sulfur dioxide
- D water

17. June/2023/Paper_0620/23/No.25

Water from a reservoir flows to the water works where purification process 1 takes place followed by process 2.

What are processes 1 and 2?

	process 1	process 2
A	chlorination	filtration
B	filtration	chlorination
C	fractional distillation	filtration
D	filtration	fractional distillation

18. June/2023/Paper_0620/23/No.29

Which statements about water are correct?

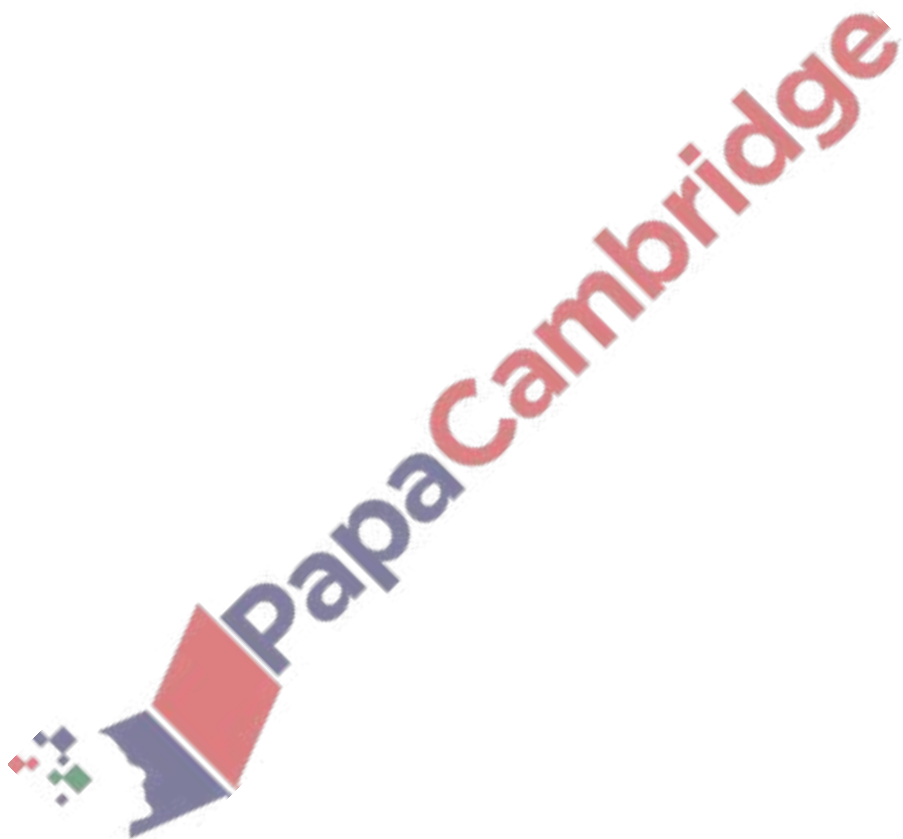
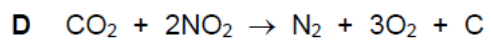
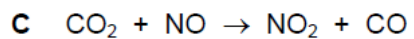
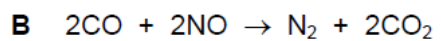
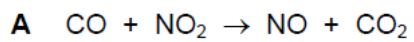
- 1 Tap water has fewer impurities than distilled water.
- 2 Tap water will turn anhydrous cobalt(II) chloride pink.
- 3 The domestic water supply is treated with carbon to kill microbes.
- 4 Phosphates from fertilisers can cause deoxygenation of water.

- A 1 and 2
- B 1 and 3
- C 2 and 4
- D 3 and 4

19. June/2023/Paper_0620/23/No.30

Oxides of nitrogen form in car engines and are removed by catalytic converters.

Which equation represents a reaction that occurs in a catalytic converter?



(a) Water from natural sources contains dissolved gases.

Choose from the list, the gas that is essential for aquatic life.
Draw a circle around your chosen answer.

argon hydrogen nitrogen oxygen [1]

(b) Polluted water may contain harmful substances such as metal compounds, plastics, nitrates and phosphates.

(i) Name one **other** harmful substance which is present in polluted water.

..... [1]

(ii) State why nitrates are harmful to aquatic life.

..... [1]

(c) Table 3.1 shows the masses of ions, in mg, present in a 1000 cm³ sample of polluted water.

Table 3.1

name of ion	formula of ion	mass of ion present in mg / 1000 cm ³ of polluted water
	NH ₄ ⁺	0.5
calcium	Ca ²⁺	2.2
chloride	Cl ⁻	2.5
hydrogencarbonate	HCO ₃ ⁻	12.0
magnesium	Mg ²⁺	0.8
nitrate	NO ₃ ⁻	0.4
potassium	K ⁺	8.3
silicate	SiO ₃ ²⁻	8.0
sodium	Na ⁺	10.2
sulfate	SO ₄ ²⁻	0.2
tin(II)	Sn ²⁺	0.4

Answer these questions using information from Table 3.1.

(i) Name the negative ion present in the highest concentration.

..... [1]

(ii) State the name of the NH_4^+ ion.

..... [1]

(iii) Calculate the mass of calcium ions present in 200 cm^3 of polluted water.

mass = mg [1]

21. June/2023/Paper_0620/31/No.8(a_b)

This question is about nitrogen and compounds of nitrogen.

(a) Nitrogen is a non-metal. Nitrogen is a poor electrical conductor.

Describe two **other** physical properties which are typical of non-metals.

1

2

[2]

(b) Oxides of nitrogen are air pollutants which contribute to acid rain.

(i) State **one** source of oxides of nitrogen in the air.

..... [1]

(ii) State one **other** adverse effect of oxides of nitrogen.

..... [1]

(a) Water from natural sources can contain metal compounds and phosphates.

(i) Name two **other** substances found in water which are harmful to aquatic life.

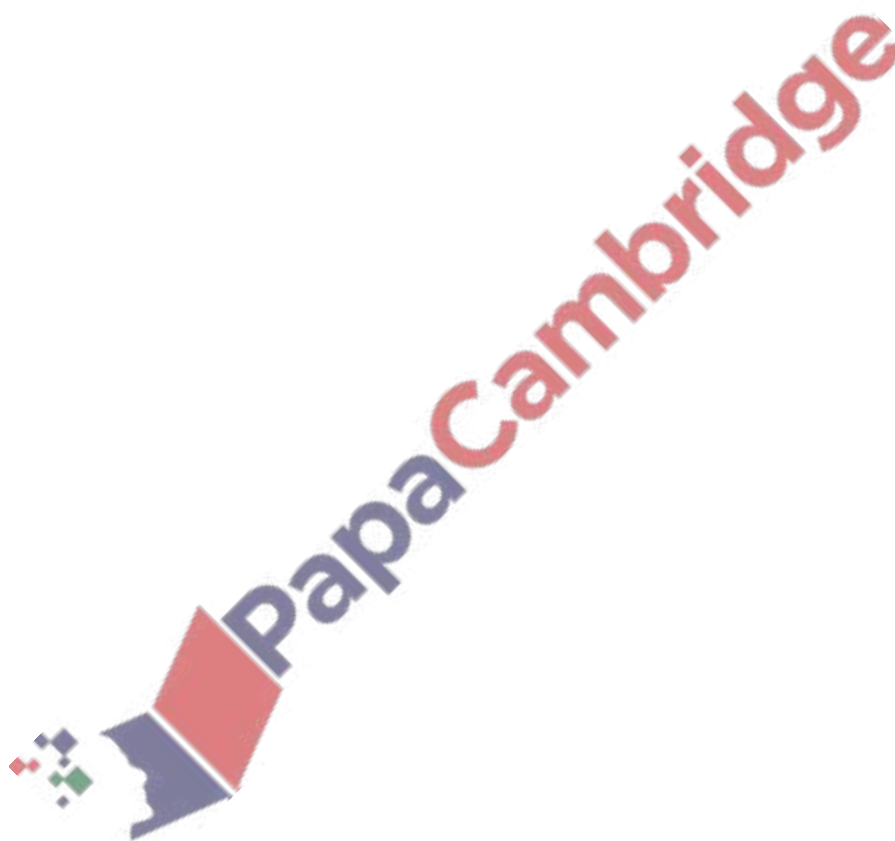
1

2

[2]

(ii) State why phosphates are harmful to aquatic life.

..... [1]



This question is about non-metals and compounds of non-metals.

(b) Methane is a compound of carbon and hydrogen.

(i) Complete Fig. 8.1 to show the dot-and-cross diagram for a molecule of methane.

Show outer shell electrons only.

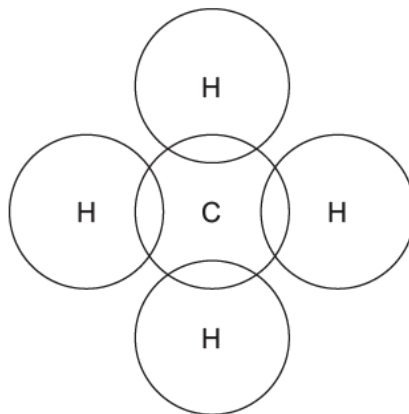


Fig. 8.1

[1]

(ii) Methane is an alkane.

Write the general formula for alkanes.

..... [1]

(iii) Methane is an air pollutant.

State **one** source of methane in the air.

..... [1]

(iv) State **one** adverse effect of methane in the air.

..... [1]

(v) Carbon particulates and water are two of the products of the incomplete combustion of methane.

Name one **other** compound formed during the incomplete combustion of methane.

..... [1]

24. June/2023/Paper_0620/33/No.3(a)

(a) Polluted water can contain harmful substances such as metal compounds, nitrates and sewage.

(i) Name two **other** substances present in polluted water which are harmful to aquatic life.

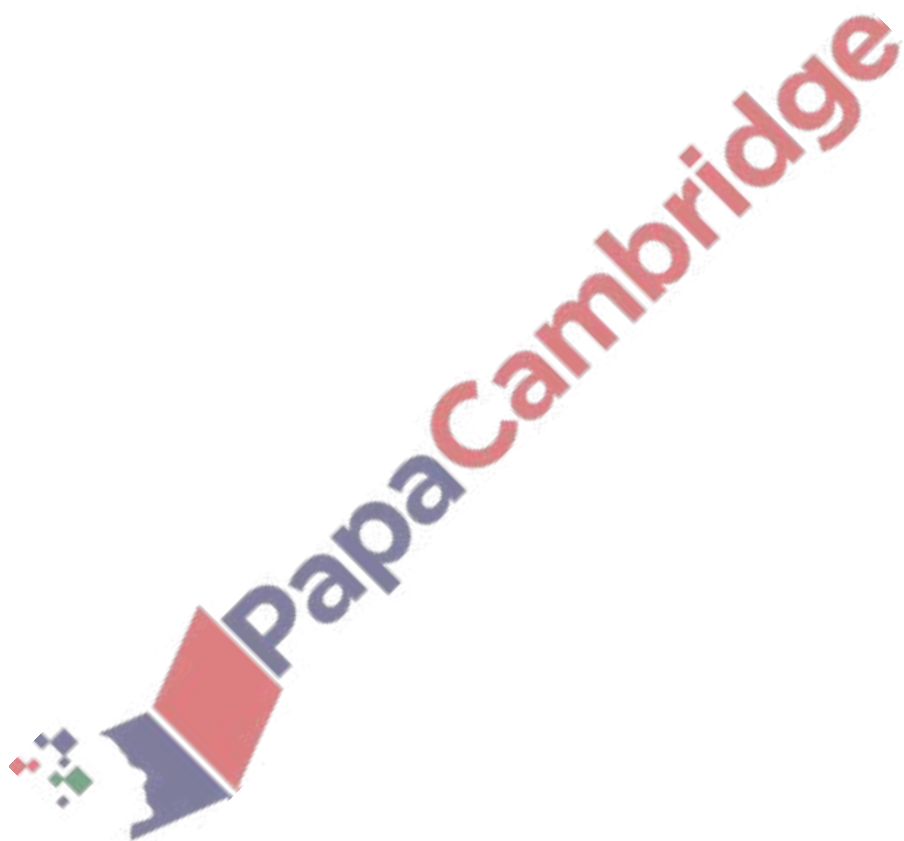
1

2

[2]

(ii) State why sewage can cause disease.

..... [1]



(b) Table 3.1 shows the masses of ions, in mg, present in 1000 cm^3 of polluted water.

Table 3.1

name of ion	formula of ion	mass of ion present in mg / 1000 cm^3 of polluted water
ammonium	NH_4^+	1.2
calcium	Ca^{2+}	2.2
chloride	Cl^-	2.5
hydrogencarbonate	HCO_3^-	13.0
magnesium	Mg^{2+}	1.0
nickel(II)	Ni^{2+}	0.2
nitrate	NO_3^-	0.4
potassium	K^+	6.3
silicate	SiO_3^{2-}	8.0
sodium	Na^+	12.2
	SO_4^{2-}	0.1

Answer these questions using information from Table 3.1.

(i) Name the positive ion present in the lowest concentration.

..... [1]

(ii) State the name of the ion SO_4^{2-} .

..... [1]

(iii) Calculate the mass of calcium ions present in 250 cm^3 of polluted water.

mass = mg [1]

26. March/2023/Paper_0620/12/No.29

Water is treated at a waterworks to make it safe to drink.

What is present in the water when it leaves the waterworks?

- A bacteria and insoluble substances
- B bacteria only
- C soluble substances, including chlorine compounds
- D chlorine compounds only

27. March/2023/Paper_0620/12/No.30

The formulae of four compounds, W, X, Y and Z, are given.

compound	formula
W	FeSO ₄
X	(NH ₄) ₃ PO ₄
Y	KNO ₃
Z	NaCl

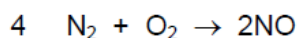
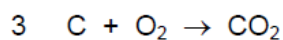
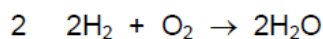
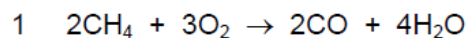
Which compounds are mixed to create a fertiliser containing the three elements necessary for improved plant growth?

- A W and X
- B W and Z
- C X and Y
- D Y and Z

28. March/2023/Paper_0620/12/No.31

Some combustion reactions produce pollutant gases.

Which reactions produce a pollutant gas that is **not** present in clean air?

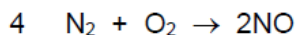
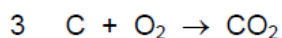
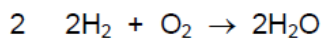
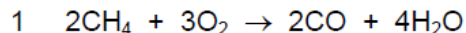


- A 1 and 3
- B 1 and 4
- C 2 and 3
- D 3 and 4

29. March/2023/Paper_0620/22/No29

Some combustion reactions produce pollutant gases.

Which reactions produce a pollutant gas that is **not** present in clean air?



A 1 and 3

B 1 and 4

C 2 and 3

D 3 and 4

30. March/2023/Paper_0620/32/No.2(d, e)

(d) Water from natural sources contains dissolved gases.

Choose from the list the gas which is essential for aquatic life.

Draw a circle around your chosen answer.

argon

hydrogen

nitrogen

oxygen

[1]

(e) Polluted water may contain sewage or nitrates.

State **one** harmful effect of each of these water pollutants.

sewage

nitrates

[2]

31. March/2023/Paper_0620/32/No.3(b, c)

(b) Oxides of nitrogen are air pollutants.

(i) State **one** source of oxides of nitrogen in the air.

..... [1]

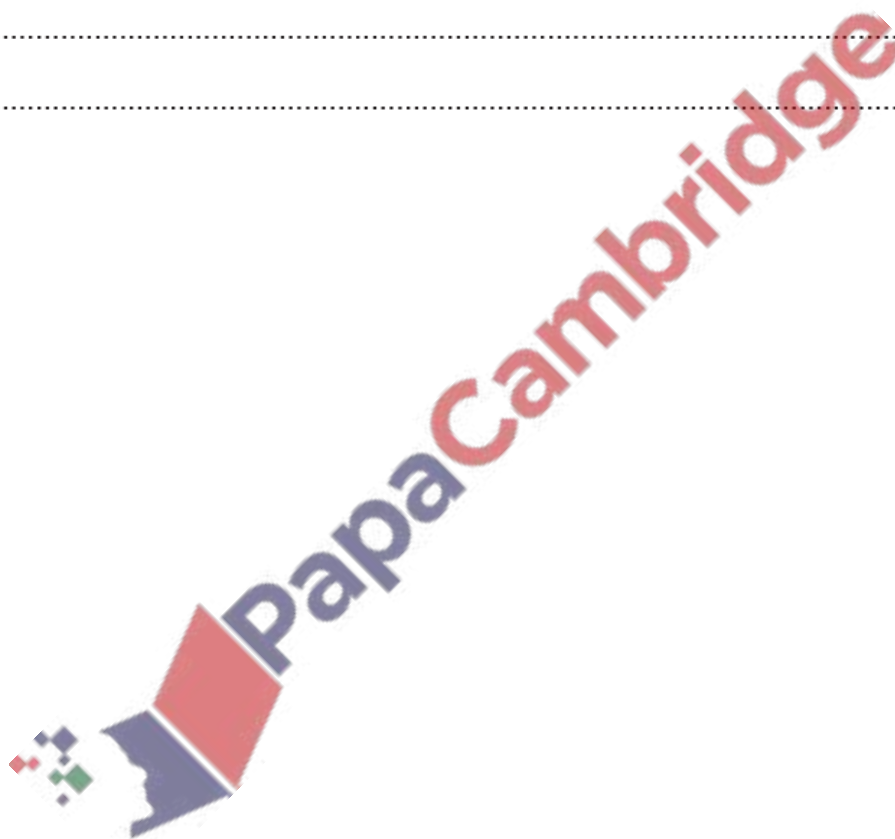
(ii) State **one** adverse effect of oxides of nitrogen.

..... [1]

(c) State whether nitrogen dioxide is an acidic or basic oxide.

Give a reason for your answer.

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



This question is about gases found in clean, dry air and gases found in polluted air.

(a) Name **one** gas found in clean, dry air which contributes to global warming.

..... [1]

(b) State the percentage of nitrogen in clean, dry air.

..... [1]

(c) Name the substance used to remove sulfur dioxide in flue gas desulfurisation.

..... [1]

(d) Nitrogen dioxide, NO_2 , is formed in car engines.

Name the equipment in a car exhaust used to remove the NO_2 formed in car engines.

..... [1]

(e) All gases diffuse.

(i) Choose from the list of formulae the gas which diffuses most quickly.

Draw a circle around your answer.

CO CO₂ CH₄ NO₂ SO₂

[1]

(ii) Explain your answer to (i).

..... [1]

(f) State **one** adverse effect of carbon monoxide on human health.

..... [1]

(g) Carbon dioxide, CO_2 , is a reactant in photosynthesis.

Name the **two** products of photosynthesis.

..... and [2]

(h) Complete the dot-and-cross diagram in Fig. 1.1 for a molecule of CO₂.

Show outer shell electrons only.

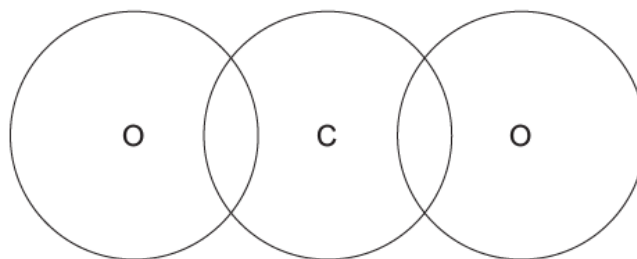


Fig. 1.1

[2]

[Total: 11]

