



Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. catenation
2. allotropes
3. amorphous
4. sublimation
5. carbon monoxide
6. reducing agent
7. water gas
8. organic

K • 4

Each carries 0.5 mark.

2 Label the diagram

1. diamond
2. each atom bonded to four others (one atom in red)
3. graphite
4. fullerene, C₆₀

K • 2

Each carries 0.5 mark.

3 Multiple choice

- i. c. It turns from solid to gas at a high temperature.

U • 1

At ordinary pressure, carbon doesn't melt: at about 3,600 °C it **sublimes**, turning straight from solid to gas. It is found only as a solid, it doesn't dissolve in water, and most of its forms are dull (diamond's sparkle is the exception, not the rule).

- ii. b. catenation

K • 1

Polythene is made of very long chains of carbon atoms joined to one another: that is **catenation**.

- iii. d. methane, methanol, chloroform, urea

U • 1

Methane (CH₄), methanol (CH₃OH), chloroform (CHCl₃) and urea (NH₂CONH₂) are all organic. Ammonia (NH₃) has no carbon at all, and carbon dioxide is counted as inorganic.

- iv. a. Firewood contains carbon.

A • 1

The black soot is unburnt carbon from the firewood, deposited on the cool pot. (Soot does pollute the air, but what the black layer proves is that firewood contains carbon.)

- v. c. carbon monoxide, because it stops the blood carrying oxygen

A • 1

With too little oxygen, carbon burns to carbon monoxide ($2C + O_2 \rightarrow 2CO$). It has no smell and no color, and it binds to hemoglobin far more strongly than oxygen, so the body is starved of oxygen without the sleeper noticing.

4 Very short answers

- a. MARKING SCHEME

K • 1

✓ Graphite.

- b. MARKING SCHEME

K • 1

✓ Any one, e.g. carbon dioxide or calcium carbonate.

- c. MARKING SCHEME

A • 1

✓ $Ca + 2C \rightarrow CaC_2$.



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ The fire uses up the oxygen, and with too little oxygen carbon burns to carbon monoxide ($2C + O_2 \rightarrow 2CO$).
- ✓ Carbon monoxide combines with hemoglobin, so the blood can't carry oxygen, and people can die in their sleep.

b. MARKING SCHEME

U • 2

- ✓ Graphite's carbon atoms are in flat layers held to each other only by weak forces.
- ✓ The layers slide over one another easily, so it makes surfaces slippery and reduces friction.

c. MARKING SCHEME

U • 2

- ✓ In graphite each carbon atom bonds with only three others, so one electron of each atom is free to move and carry a current.
- ✓ In diamond each carbon atom uses all four outer electrons to bond with four others, so there are no free electrons.

d. MARKING SCHEME

A • 2

- ✓ The black mass is sugar charcoal, carbon: sugar contains carbon.
- ✓ Heating drives the hydrogen and oxygen of sugar ($C_{12}H_{22}O_{11}$) out as water vapor, leaving the carbon.

6 Long answer

ANSWER

A • 4

Yes, it will (mostly) solve it.

The cause: grease is an **organic** compound. Like most organic compounds, it doesn't dissolve in water, because its molecules can't form hydrogen bonds with water. That is why water alone couldn't lift it.

The solution: organic compounds dissolve in **organic solvents**, and petrol is one. The petrol dissolves the grease, which can then be washed away. (Dry cleaners use organic solvents in the same way.)

But be careful: petrol catches fire very easily and its vapor is harmful. Use only a little, outdoors, far from any flame, and wash the cloth well afterwards. Kerosene works too, and so does rubbing a little detergent into the stain: detergent molecules have one end that holds on to grease and another that holds on to water.

MARKING SCHEME

- ✓ Yes, rubbing a little petrol will remove the stain.
- ✓ The cause: grease is an organic compound, and most organic compounds don't dissolve in water.
- ✓ The solution: organic compounds dissolve in organic solvents, and petrol is one, so it dissolves the grease.
- ✓ Petrol catches fire easily and its vapor is harmful, so only a little should be used, outdoors and far from any flame.

7 Reactions of carbon

a. MARKING SCHEME

A • 1

- ✓ $C + O_2 \rightarrow CO_2$.

b. MARKING SCHEME

A • 1

- ✓ $2C + O_2 \rightarrow 2CO$.

c. MARKING SCHEME

A • 1

- ✓ $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$.

d. MARKING SCHEME

A • 1

- ✓ $C + H_2O \rightarrow CO + H_2$.



8 Think

ANSWER

HA · 2

Burn a piece of each in oxygen. Both burn completely and give only one product, carbon dioxide (it turns lime water milky), and nothing else is left: $C + O_2 \rightarrow CO_2$. (Burning equal masses of the two gives equal masses of carbon dioxide.)

MARKING SCHEME

- ✓ Burn each in oxygen.
- ✓ Both give only carbon dioxide (which turns lime water milky), leaving nothing behind, so both are pure carbon.

9 Activity: Organic or inorganic? (Activity 18.4)

(not marked)

WHAT STUDENTS SHOULD FIND

Sugar dissolves, melts and chars black; ghee and wax don't dissolve, and melt easily (and burn): all three are organic. Common salt dissolves but doesn't melt or char in a spoon; baking soda dissolves a little and doesn't char; chalk hardly dissolves and doesn't change: all three are inorganic.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	9	8	13	2	32

