Q1. Copper is a transition metal.

(a) (i) Where is copper in the periodic table?

Tick (✓) **one** box.

in the central block ☐

in Group 1 ☐

in the noble gas group ☐

(1)

(ii) What is a property of copper?

Tick (✓) **one** box.

breaks easily ☐

conducts electricity ☐

does not conduct heat ☐

(1)

(b) Copper ores are quarried by digging large holes in the ground, as shown in **Figure 1**.

Figure 1

© photllurg/iStock/Thinkstock

Give **two** reasons why quarrying is bad for the environment.

.....

.....

.....

.....

(2)

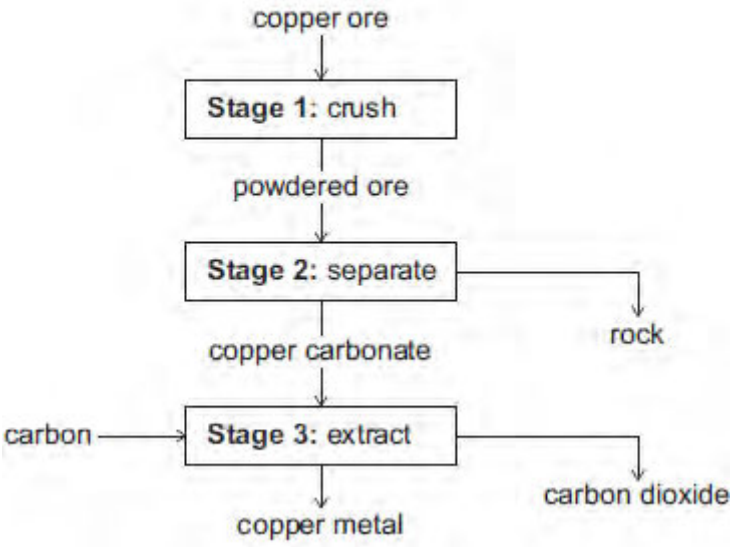
(c) Some copper ores contain only 2% copper.

Most of the ore is rock that is not needed.

In one ore, the main compound is copper carbonate ($CuCO_3$).

Figure 2 shows the stages used in the extraction of copper from this ore.

Figure 2



(i) Why is **Stage 2** important?

.....

.....

(1)

(ii) The equation for the reaction in **Stage 3** is:

$$2\ CuCO_3 + C \longrightarrow 2\ Cu + 3\ CO_2$$

From the symbol equation, a company calculated that 247 tonnes of copper carbonate are needed to produce 127 tonnes of copper and 132 tonnes of carbon dioxide are released.

Calculate the mass of carbon needed to make 127 tonnes of copper.

copper carbonate	+	carbon	⟶	copper	+	carbon dioxide
247 tonnes		..... tonnes		127 tonnes		132 tonnes

.....

.....

(2)

(iii) Suggest **one** reason why it is important for the company to calculate the mass of reactants in **Stage 3**.

.....

.....

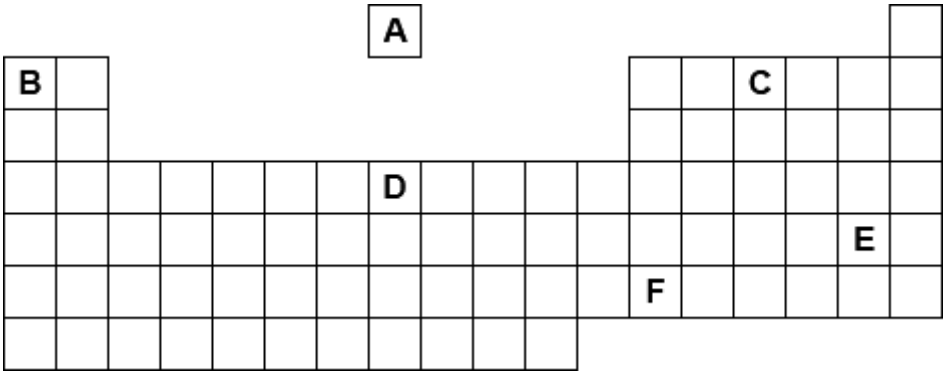
(1)

(Total 8 marks)

Q2. (a) Use the periodic table on the Data Sheet to help you answer these questions.

Part of the periodic table is shown below.

The letters are **not** the symbols of the elements.



Choose your answers **only** from the letters shown in the periodic table above.

Which letter, **A**, **B**, **C**, **D**, **E** or **F**, represents

(i) hydrogen Letter ☐

(1)

(ii) a Group 3 element Letter ☐

(1)

(iii) a halogen Letter ☐

(1)

(iv) the element with atomic (proton) number of 7 Letter ☐

(1)

(v) an element with one electron in its outer shell? Letter

(1)

(b) The table shows the melting points of the Group 1 metals arranged in alphabetical order.

Group 1 metal		
Name	**Symbol**	**Melting point in °C**
Caesium	Cs	29
Francium	Fr	27
Lithium	Li	180
Potassium	K	64
Rubidium	Rb	39
Sodium	Na	98

(i) Arrange these metals in order of increasing melting point. Three have been done for you.

Fr Cs Li

Lowest ⟶ Highest

(1)

(ii) Use the periodic table on the Data Sheet **and** your answer in part (b)(i) above to complete this sentence about how the melting points change.

Going down Group 1, the melting points .....

(1)

(c) The transition metals are a block of elements between Groups 2 and 3 of the periodic table. Transition metals have different properties to Group 1 metals.

Put ticks (✓) next to the **three** correct statements about transition metals in the table below.

Statement	(✓)
They are harder than Group 1 metals	
They have lower densities than Group 1 metals	
They have higher melting points than Group 1 metals	
They are more reactive with water than Group 1 metals	
They often form coloured compounds but Group 1 compounds are usually white	

(3)
(Total 10 marks)

Q3. The periodic table on the Data Sheet may help you to answer some of these questions.

(a) Draw a ring around the correct answer to complete these sentences.

(i)

	compounds.
Dimitri Mendeleev attempted to classify	elements.
	mixtures.

(1)

(ii)

	atomic weight.
He arranged them in order of their	boiling point.
	electrical conductivity.

(1)

(iii)

	atomic (proton) number.
They are now arranged in order of their	atomic weight.
	mass number.

(1)

(b) In the periodic table between Groups 2 and 3 there is a block of metals which includes chromium, iron and nickel.

(i) Which **one** of the following is the correct name for this block of metals?

Draw a ring around the correct answer.

alkali metals **reactive metals** **transition metals**

(1)

(ii) The properties of iron and those of the Group 1 metal sodium are different.

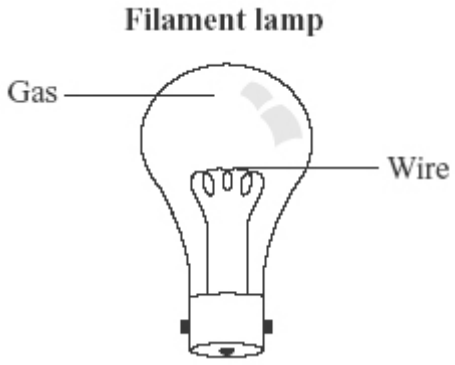
Put a tick (✓) next to the **two** correct phrases which could complete the following sentence.

Compared to sodium, iron

	(✓)
has a higher melting point.	
has a lower density.	
is harder.	
is more reactive.	
is weaker.	

(2)
(Total 6 marks)

Q4. When electricity passes through a thin wire, the wire gets hot. If the wire gets very hot, it may glow. This idea is used in filament lamps.



(a) The table shows some metals and their melting points.

Metal	Melting point in °C
Aluminium	660
Copper	1084
Iron	1540
Tungsten	3410

Which metal in the table should be used to make the wire in a filament lamp?

Give a reason for your answer.

.....

.....

.....

.....

(2)

(b) The table shows some gases.

Gas
Argon
Carbon dioxide
Oxygen
Sulfur dioxide

Which gas in the table should be used in a filament lamp?

Give a reason for your answer.

.....

.....

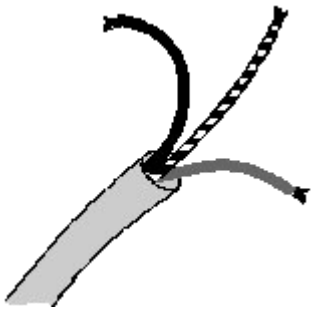
.....

.....

(2)
(Total 4 marks)

Q5. The properties of transition metals make them useful elements.

(a) Why is copper used for electrical wiring?

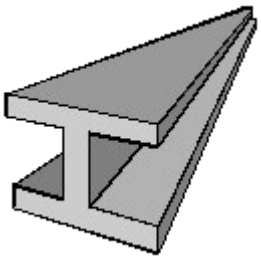


.....

.....

(1)

(b) Why is iron used for girders in buildings?



.....

.....

(1)

(c) Why are transition metal compounds added to glazes for pottery?

.....

.....

(1)

(Total 3 marks)

Q6. Niobium is a typical transition metal.

Put a tick (✓) next to each of the **four** properties in the table that you would expect for Niobium.

Property	
brittle	
conducts heat	
dull	
forms coloured compounds	
high melting point	
low boiling point	
strong	
very reactive	

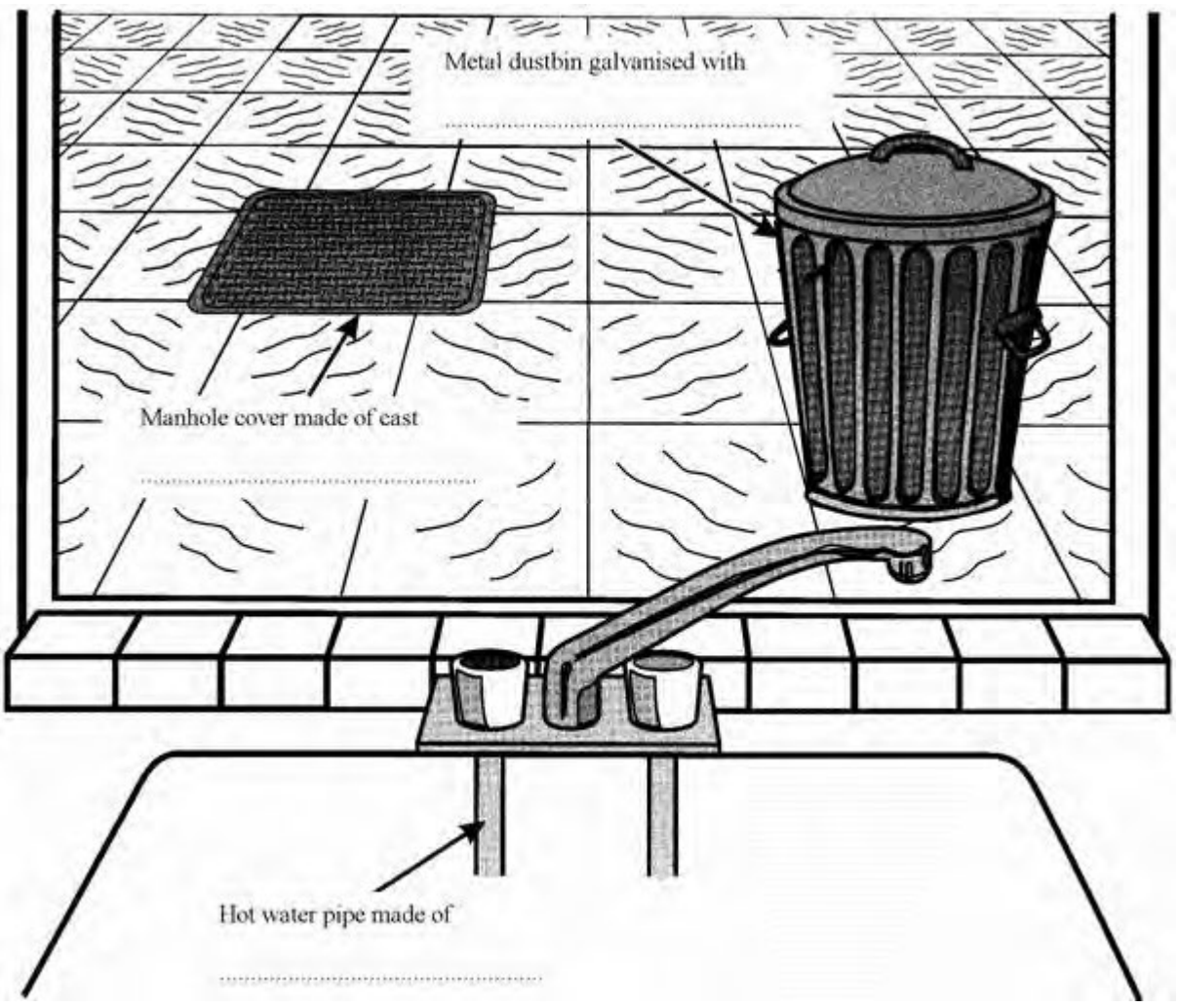
(Total 4 marks)

##

The word box contains the names of some metals.

aluminium	copper	iron	manganese	zinc

(i) The drawing shows the view from a window. Choose from the names of metals in the box to complete the **three** spaces.



(3)

(ii) What is the name of the metal in the word box which has the chemical symbol Fe?

.....

(1)

(iii) What is the name of **one** metal in the word box which often has coloured compounds?

.....

(1)

(Total 5 marks)