

IB Chemistry HL - S2.3

The metallic model

Exercises + Practice questions

Official answers appended at the end

Exercise

- Q1.** Which is the best definition of metallic bonding?
- A** the attraction between cations and anions
 - B** the attraction between cations and delocalized electrons
 - C** the attraction between nuclei and electron pairs
 - D** the attraction between nuclei and anions
- Q2.** Explain, with reference to the features of the metallic model of bonding, the following properties:
- (a)** electrical conductivity
 - (b)** thermal conductivity
 - (c)** malleability

- Q3.** Aluminium is a widely used metal. What properties make it suitable for the following applications?
- | | |
|------------------|-----------------------|
| (a) baking foil | (b) aircraft bodywork |
| (c) cooking pans | (d) tent frames |
- Q4.** Explain the difference in the melting points of lithium and beryllium, which melt at 180.5 °C and 1287 °C respectively.
- Q5.** Use the periodic table to identify the predicted trend in melting points of sodium (Na), potassium (K) and rubidium (Rb).
- | | |
|----------------------|----------------------|
| A Rb > K > Na | B K > Na > Rb |
| C Na > K > Rb | D Na > Rb > K |
- Q6.** Explain the general trend of decreasing melting point down group 2 metals.

Exercise

Q7. Which of the following are transition elements?

I. Zirconium (Zr) II. Palladium (Pd) III. Lead (Pb)

A I and II only **B** I and III only **C** II and III only **D** I, II and III

Q8. Explain why transition elements tend to have higher melting points than s and p block metals.

Q9. Explain, with reference to the metallic model of bonding, why transition elements have high electrical conductivity.

Practice questions

1. Which combination would produce the strongest metallic bond?

	Charge on cations	Ionic radius
A	small	small
B	small	large
C	large	small
D	large	large

2. Which metal has the strongest metallic bonding?

- A Na B K
C Mg D Al

3. Which of the following elements is most likely to be metallic?

	Electrical conductivity	
	Molten	Solid
A	good	good
B	good	poor
C	poor	good
D	poor	poor

4. Which series shows the correct order of metallic bond strength from strongest to weakest?

- A Rb > K > Na > Li B Li > Na > K > Rb
C Rb > Na > K > Li D Li > K > Na > Rb

5. Calcium, Ca, and strontium, Sr, are both group 2 elements that contain metallic bonding.

(a) Describe the metallic model of bonding and explain how it contributes to electrical conductivity. (3)

(b) Explain why calcium has a higher melting point than strontium. (2)

(Total 5 marks)

6. Explain, with reference to the metallic model of bonding, why metals are generally malleable and good thermal conductors. (4)

(Total 4 marks)

7. **HL** The transition element gold, Au, is used in electrical circuits due to its high electrical conductivity.

Explain why transition elements are generally better electrical conductors than s and p block metals. (2)

(Total 2 marks)

S2.3 - Official Answers

Pearson answer pages from the back of the textbook