# A miniature reference table

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

**Name** _____ **Date** _____

Normal melting and boiling temperatures (°C) at 1 atm: substance X, −95 and 65; substance Y, 5 and 105. An unknown sample is liquid at 20 °C and gas at 80 °C at equilibrium. Use the supplied practice reference throughout this section.

| Substance | Melting (°C) | Boiling (°C) |
|---|---|---|
| X | −95 | 65 |
| Y | 5 | 105 |

**1. Which substance matches the observations?**

- ○ A X only
- ○ B Y only
- ○ C Both X and Y
- ○ D Neither X nor Y

**2. What phase is Y at 0 °C and 1 atm at equilibrium?**

- ○ A All phases in equal amounts
- ○ B Gas
- ○ C Solid
- ○ D Liquid

**3. Compare the normal boiling points and explain what they suggest about intermolecular attractions, assuming two molecular liquids of similar size.**

# Atoms in a labeled sample

Use the stimulus and your course knowledge.

**Name** _____ **Date** _____

A neutral sample contains isotopes Z-24 and Z-26 of element Z, atomic number 12. Their abundances are 75% and 25%. For this exercise use 24 u and 26 u for their masses.

**4. How many neutrons are in Z-26?**

- ○ A 12
- ○ B 38
- ○ C 26
- ○ D 14

**5. Which change forms $Z^{2+}$ from a neutral Z atom?**

- ○ A Loss of two protons
- ○ B Gain of two electrons
- ○ C Loss of two electrons
- ○ D Gain of two neutrons

**6. Calculate the weighted mean atomic mass and explain why it is closer to one isotope's mass.**

# An aqueous redox reaction

Use the stimulus and your course knowledge.

**Name** _____ **Date** _____

The net ionic equation is $Mg(s) + 2Ag^{+}(aq) \rightarrow Mg^{2+}(aq) + 2Ag(s)$. Use the equation to answer all three questions.

**7. Which species is reduced?**

- ○ A Mg(s)
- ○ B $Ag^{+}$
- ○ C An electron
- ○ D $Mg^{2+}$

**8. Which is the reducing agent?**

- ○ A Mg(s)
- ○ B $Ag^{+}$
- ○ C $Mg^{2+}$
- ○ D Ag(s)

**9. Write balanced oxidation and reduction half-reactions in compatible multiples. Show how their electron counts relate.**

# A dissolving and cooling sample

Use the stimulus and your course knowledge.

**Name** _____ **Date** _____

Practice solubility data for a salt: 24 g per 100 g water at 20 °C and 48 g per 100 g water at 60 °C. A sample has 60 g of salt completely dissolved in 150 g of water at 60 °C. No water evaporates.

**10. How much salt could dissolve at most in this water at 60 °C?**

- ○ A 48 g
- ○ B 72 g
- ○ C 96 g
- ○ D 60 g

**11. How should the initial solution be classified?**

- ○ A Supersaturated
- ○ B A suspension of undissolved solid
- ○ C Saturated
- ○ D Unsaturated

**12. After cooling to 20 °C and reaching equilibrium, calculate the mass that crystallizes and describe the opposing processes at the solid-solution boundary.**