Name:
Score: 0 / 20 points (0%)

Chapter 14 Review Quiz

Multiple Choice
Identify the choice that best completes the statement or answers the question.

___ 1. When a compound is heated in a Bunsen burner flame the colour observed can give an indication of the:
a. electron configuration of the atoms in the compound.
b. the number of elements in the compound.
c. the type of bonding in the compound.
d. the identity of cations in the compound.

ANSWER: D
Flames tests give the identity of metallic cations in a compound.
POINTS: 0 / 1
FEEDBACK:
REF: 407

___ 2. Which of the following metal ions could be incorporated into fireworks to produce a yellow light?
a. Na^+
b. K^+
c. Ca^{2+}
d. Fe^{2+}

ANSWER: A
Sodium ions produce a yellow light when excited.
POINTS: 0 / 1
FEEDBACK:
REF: 410

___ 3. Which of the following combinations would not form a precipitate?
a. lead iodide
b. magnesium oxide
c. barium hydroxide
d. calcium carbonate

ANSWER: C
According to the solubility rules, barium hydroxide is soluble.
POINTS: 0 / 1
FEEDBACK:
REF: 412

___ 4. A student was given four solutions and told each contained one of the following cations:

Pb2+ Ag2+ Ba2+ Ca2+ Mg2+ Fe3+.

The results of a series of tests that were conducted are given below.

REAGENT ADDED	P	Q	R	S
KI	yellow ppt	NP	yellow ppt	NP
H_2SO_4	NP	NP	ppt	ppt
NaOH	Brown ppt	ppt	ppt	NP

NP–no precipitate; ppt–precipitate formed

Which of the following correctly identifies each of the solutions?

a. P = Fe^{3+}; Q = Mg^{2+}; R = Pb^{2+}; S = Ca^{2+}
b. P = Ag^{+}; Q = Mg^{2+}; R = Pb^{2+}; S = Ba^{2+}
c. P = Ag^{+}; Q = Ca^{2+}; R = Ba^{2+}; S = Mg^{2+}
d. P = Fe^{3+}; Q = Ba^{2+}; R = Ca^{2+}; S = Mg^{2+}

ANSWER: B
Using the precipitation rules, the formation of precipitates matches answer B.
POINTS: 0 / 1
FEEDBACK:
REF: 412

5. If the substance contains the hydroxide ion, what is the expected results of Tests 1, 2 and 3?

	Test 1	Test 2	Test 3
i	Pale green flame	Red litmus turns blue	No Bubbles
ii	Green flame	Red litmus turns blue	Bubbles
iii	Yellow flame	Blue litmus turns red	bubbles
iv	Pale green flame	No change	No bubbles

a. i
b. ii
c. iii
d. iv

ANSWER: A
Hydroxide ions are basic so red litmus changes to blue but neutralise acid to produce salt and water only.
POINTS: 0 / 1
FEEDBACK:
REF: 421

6. A further test was conducted to confirm the identity of the cation in the substance. The addition of SO_4^{2-} ion produced a white precipitate. The cation present in the substance would be:

a. Mg^{2+}.
b. Ba^{2+}.
c. Ca^{2+}.
d. Pb^{2+}.

ANSWER: B
Barium gives a pale green flame and produces a ppt with SO_4^{2-} ion.
POINTS: 0 / 1
FEEDBACK:
REF: 417

7. A ligand is best described as a:

a. molecule or ion that bonds to a central ion.
b. complex ion containing neutral molecules surrounding a central ion.
c. species containing ions surrounding an oppositely charged central ion.
d. complex ion containing molecules attached to a cation at more than one point.

ANSWER: A
A ligand is a species that bonds to a central ion.
POINTS: 0 / 1
FEEDBACK:
REF: 417

___ 8. Which of the following species is least likely to act as a ligand?
a. PH_3
b. CN^-
c. NH_4^+
d. H_2O

ANSWER: C
A ligand acts as an electron pair donor. NH_4^+ does not have an electron pair to donate
POINTS: 0 / 1
FEEDBACK:
REF: 417

___ 9. The most effective test to distinguish between Fe^{2+} and Fe^{3+} is to react the sample with:
a. Cl^-
b. F^-
c. OH^-
d. SCN^-

ANSWER: D
While reaction with OH^- may distinguish between iron(II) and iron(III), the most effective test is the addition of SCN^-, which produces a blood red solution with iron(III).
POINTS: 0 / 1
FEEDBACK:
REF: 420

___ 10. Which of the following statements is incorrect regarding the use of precipitation with Ag+ to distinguish between Cl^-, Br^- and I^-?
a. All produce a precipitate with Ag^+.
b. The precipitates have a similar colour.
c. The precipitates have a similar solubility in ammonia.
d. None of the above.

ANSWER: C
Silver halide precipitates have different solubility on ammonia.
POINTS: 0 / 1
FEEDBACK:
REF: 422

___ 11. Precipitation titrations may be conducted by different methods. Which of the following statements about precipitation titrations is correct?
a. Mohr's method requires a back titration.
b. Volhard's method uses SCN^- indicator.
c. Fajan method requires a blank titration to be conducted.
d. All of the above.

ANSWER: B
Mohr's method is a direct titration while Fajan does not require a blank.
POINTS: 0 / 1
FEEDBACK:
REF: 425

___ 12. A precipitation titration using Volhard's method was conducted to determine the amount of sodium chloride in a particular brand of sausages.

The sausages were processed in a blender and mixed with 100 mL distilled water. 50 mL of a 0.1 mol L^{-1} silver nitrate was mixed with 25 mL of the solution.
The Fe^{3+} ions were added to the excess silver nitrate, which was titrated against 0.08 mol L^{-1} sodium thiocyanate. 42 mL of titrant was required to reach end point.
What is the concentration of sodium chloride in the sausages?

a. 1.64×10^{-3} mol L^{-1}
b. 3.36×10^{-3} mol L^{-1}
c. 6.6×10^{-2} mol L^{-1}
d. 1.3×10^{-1} mol L^{-1}

ANSWER: C
Using the calculations for a back titration the initial concentration of NaCl is 6.6×10^{-2} mol L^{-1}.
POINTS: 0 / 1
FEEDBACK:
REF: 425

___ 13. To perform a successful gravimetric analysis to determine the percentage of copper in a sample of copper ore, which of the following is NOT necessary?

a. Weighing the sample of ore accurately
b. Using a solvent to dissolve the copper in the ore
c. Determining the end point using an indicator
d. Using filtration to separate the precipitate

ANSWER: C
Gravimetric analysis does not require an end point to be determined.
POINTS: 0 / 1
FEEDBACK:
REF: 431

___ 14. Hard water is water that contains high concentrations of calcium ions, which reduce the effectiveness of soaps and detergents. These ions can be removed by precipitation of Ca^{2+} using sodium bicarbonate according to the reaction:

$$Ca^{2+}(aq) + 2HCO_3^-(aq) \rightarrow CaCO_3(s) + H_2O(l) + CO_2(g).$$

Excess $NaHCO_3$ was added to 100mL water sample. The sample was filtered, the precipitate dried and weighed. The weight of the dried precipitate was 0.0273 g.
What is the concentration of calcium ions in the water?

a. 2.73×10^{-6} mol L^{-1}
b. 2.73×10^{-4} mol L^{-1}
c. 1.34×10^{-3} mol L^{-1}
d. 2.73×10^{-3} mol L^{-1}

ANSWER: D
Moles precipitate = 0.0273/100.1 = 2.73×10^{-4}; c = $2.73 \times 10^{-4}/0.1 = 2.73 \times 10^{-3}$ mol L^{-1}
POINTS: 0 / 1
FEEDBACK:
REF: 431

___ 15. Which of the following is NOT a source of error in gravimetric analysis?

a. Contamination with other ions
b. Too much of precipitation reagent

c. Loss of sample in filtering
d. Water still remaining in the sample

ANSWER: B
Excess reagent to precipitate identified species is necessary to ensure all required ions are precipitated.
POINTS: 0 / 1
FEEDBACK:
REF: 431

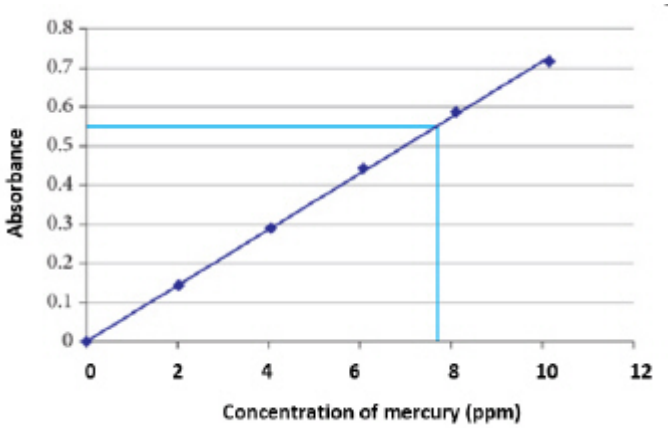
___ 16. A major advantage that atomic absorption spectroscopy has over flame tests when analysing the composition of chemical samples is that:
a. the samples do not have to be heated.
b. more than one element in the sample can be identified.
c. it is specific to transition metals.
d. the samples are not destroyed in the process.

ANSWER: B
Flame testing uses colour so can only identify elements that produce a coloured flame.
POINTS: 0 / 1
FEEDBACK:
REF: 434

___ 17. Which of the following statements is correct for atomic absorption spectroscopy (AAS)?
a. AAS is only a quantitative technique.
b. The equipment used in AAS directly measures the concentration of an element in a sample.
c. The sample being tested needs to be vaporised so that gaseous atoms are present.
d. None of the above are true.

ANSWER: C
AAS can also be used to determine different elements present in a sample as well as the amount. AAS measures the amount of light absorbed, which is related to concentration.
POINTS: 0 / 1
FEEDBACK:
REF: 434

___ 18. Refer to the graph below.



The concentration of a mercury sample that produced an absorbance reading of 0.4 is closest to:
a. 0.3 ppm.
b. 5.0 ppm.
c. 5.7 ppm.

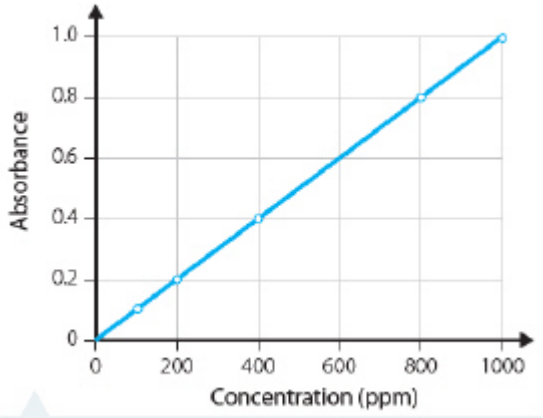
d. 6.0 ppm.

ANSWER: C
Value is interpolated from the graph.
POINTS: 0 / 1
FEEDBACK:
REF: 436

___ 19. Solutions that are coloured may be analysed using colourimetry. Which of the following statements about colourimetry are incorrect?
a. The amount of light absorbed by the solution depends on the concentration.
b. Red solutions absorb light in the green and blue regions of the spectrum.
c. A blank containing pure solvent allows for absorption of the solvent.
d. Each species in solution absorbs only a single wavelength.

ANSWER: D
Coloured species absorb across a band of wavelengths.
POINTS: 0 / 1
FEEDBACK:
REF: 438

___ 20. A calibration curve for a solution of copper(II) tetrammine, $[Cu(NH_3)_4(H_2O)_2]^{2+}$ is given below:



A sample with a concentration of 500 mg L^{-1} would have an absorbance of:
a. 0.05
b. 0.40
c. 0.50
d. 0.70

ANSWER: D
Interpreted from graph.
POINTS: 0 / 1
FEEDBACK:
REF: 438

Retake