1 Which is the equation for the reaction when steam passes over strongly heated magnesium?

☒ **A** $Mg(s) + 2H_2O(l) \rightarrow Mg(OH)_2(aq) + H_2(g)$

☒ **B** $Mg(s) + 2H_2O(g) \rightarrow Mg(OH)_2(s) + H_2(g)$

☒ **C** $Mg(s) + H_2O(l) \rightarrow MgO(s) + H_2(g)$

☒ **D** $Mg(s) + H_2O(g) \rightarrow MgO(s) + H_2(g)$

(Total for Question = 1 mark)

2 Which one of the following substances forms when a few drops of concentrated sulfuric acid is added to sodium chloride?

☒ **A** H_2O

☒ **B** Cl_2

☒ **C** $NaHSO_4$

☒ **D** SO_2

(Total for Question = 1 mark)

PhysicsAndMathsTutor.com

3 This question is about the reaction between sodium carbonate solution and dilute nitric acid.

$$Na_2CO_3(aq) + 2HNO_3(aq) \rightarrow 2NaNO_3(aq) + CO_2(g) + H_2O(l)$$

(a) What is the **ionic** equation for this reaction?

(1)

☒ **A** $Na_2CO_3(aq) + 2H^+(aq) \rightarrow 2Na^+(aq) + CO_2(g) + H_2O(l)$

☒ **B** $Na^+(aq) + N\ {}^-_3(aq) \rightarrow NaNO_3(aq)$

☒ **C** $CO_3^{2-}(aq) + 2H^+(aq) \rightarrow CO_2(g) + H_2O(l)$

☒ **D** $CO_3^{2-}(aq) + 2HNO_3(aq) \rightarrow 2NO_3^-(aq) + CO_2(g) + H_2O(l)$

(b) What is the volume of carbon dioxide produced from the complete reaction of 0.10 mol of nitric acid at room temperature and pressure?

[1 mol of any gas occupies 24 dm^3 at room temperature and pressure.]

(1)

☒ **A** 1.2 dm^3

☒ **B** 1.8 dm^3

☒ **C** 2.4 dm^3

☒ **D** 3.6 dm^3

(c) What volume of sodium carbonate solution of concentration 0.500 mol dm^{-3}, would be needed to completely react with 25.0 cm^3 of nitric acid of concentration 0.250 mol dm^{-3}?

(1)

☒ **A** 6.25 cm^3

☒ **B** 12.50 cm^3

☒ **C** 18.75 cm^3

☒ **D** 25.00 cm^3

(Total for Question = 3 marks)

PhysicsAndMathsTutor.com

4 In which of the following reactions is sulfuric(IV) acid, H_2SO_3, acting as an oxidizing agent?

☒ **A** $H_2SO_3 + H_2O \rightarrow H_3O^+ + HSO_3^-$

☒ **B** $H_2SO_3 \rightarrow SO_2 + H_2O$

☒ **C** $H_2SO_3 + 2FeCl_3 + H_2O \rightarrow 2FeCl_2 + H_2SO_4 + 2HCl$

☒ **D** $H_2SO_3 + 2H_2S \rightarrow 3H_2O + 3S$

(Total for Question = 1 mark)

5 Which of the following is a redox reaction?

☒ **A** $Cr_2O_7^{2-} + 2OH^- \rightarrow 2CrO_4^{2-} + H_2O$

☒ **B** $[Cu(H_2O)_6]^{2+} + 4Cl^- \rightarrow [CuCl_4]^{2-} + 6H_2O$

☒ **C** $4OH^- + 4MnO_4^- \rightarrow 4MnO_4^{2-} + 2H_2O + O_2$

☒ **D** $[Fe(H_2O)_6]^{3+} + 3OH^- \rightarrow [Fe(H_2O)_3(OH)_3] + 3H_2O$

(Total for Question = 1 mark)

6 The oxidation state of nickel is **not** +2 in

☒ **A** $[Ni(CO)_4]$

☒ **B** $[Ni(H_2O)_4(OH)_2]$

☒ **C** $[Ni(NH_3)_6]^{2+}$

☒ **D** $[Ni(CN)_4]^{2-}$

(Total for Question = 1 mark)

PhysicsAndMathsTutor.com

7 What is the oxidation number of phosphorus in P_4O_6?

☒ **A** +3

☒ **B** +4

☒ **C** +5

☒ **D** +6

(Total for Question = 1 mark)

8 What is the oxidation number of chlorine in Cl_2O_7?

☒ **A** –1

☒ **B** +1

☒ **C** –7

☒ **D** +7

(Total for Question = 1 mark)

9 The thermite reaction, shown below, is a useful industrial process.

$$Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s)$$

The iron in this reaction undergoes

☒ **A** disproportionation.

☒ **B** oxidation.

☒ **C** redox.

☒ **D** reduction.

(Total for Question = 1 mark)

PhysicsAndMathsTutor.com

10 In nitric(V) acid, HNO_3, the oxidation number of the nitrogen is +5

This means that the **nitrogen** in nitric acid

☒ **A** has five electrons in its outer shell.

☒ **B** is an ion with a charge of +5.

☒ **C** would have a charge of +5 if its bonding electrons were transferred completely.

☒ **D** forms five covalent bonds in total.

(Total for Question = 1 mark)

11 The equation representing the reaction between copper(II) oxide and dilute sulfuric acid is

$$CuO(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l)$$

The **ionic** equation for the reaction is

☒ **A** $Cu^{2+}(s) + SO_4^{2}\ (aq) \rightarrow CuSO_4(aq)$

☒ **B** $O^{2}\ (s) + H_2SO_4(aq) \rightarrow H_2O(l) + SO_4^{2}\ (aq)$

☒ **C** $CuO(s) + 2H^{+}(aq) \rightarrow Cu^{2+}(aq) + H_2O(l)$

☒ **D** $CuO(s) + H_2SO_4(aq) \rightarrow Cu^{2+}SO_4^{2}\ (aq) + H_2O(l)$

(Total for Question 1 mark)

12 The oxidation number of sulfur in sodium hydrogensulfide, NaHS, is

☒ **A** 2

☒ **B** 1

☒ **C** +1

☒ **D** +2

(Total for Question 1 mark)

PhysicsAndMathsTutor.com

13 Which of the following is **not** a disproportionation reaction?

☒ **A** $Cl_2 + 2OH \rightarrow Cl + ClO + H_2O$

☒ **B** $Cu_2O + H_2SO_4 \rightarrow CuSO_4 + Cu + H_2O$

☒ **C** $3IO \rightarrow 2I + IO_3$

☒ **D** $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$

(Total for Question 1 mark)

14 When solutions of iodine are titrated with aqueous sodium thiosulfate solution, $Na_2S_2O_3(aq)$, the thiosulfate ions are oxidized to

☒ **A** $S_2O_4^{2-}$

☒ **B** $S_2O_6^{2-}$

☒ **C** $S_2O_8^{2-}$

☒ **D** $S_4O_6^{2-}$

(Total for Question = 1 mark)

15 What is the oxidation number of chlorine in the ClO_3^- ion?

☒ **A** –1

☒ **B** +4

☒ **C** +5

☒ **D** +6

(Total for Question = 1 mark)

16 Which of these reactions is **not** a redox reaction?

☒ **A** $Mg(NO_3)_2(s) \rightarrow MgO(s) + 2NO_2(g) + ½O_2(g)$

☒ **B** $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

☒ **C** $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

☒ **D** $Cl_2(aq) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2(aq)$

(Total for Question = 1 mark)

17 Iodine can react with sodium hydroxide solution to form $NaIO_3(aq)$, according to the equation below.

$$3I_2(aq) + 6NaOH(aq) \rightarrow 5NaI(aq) + NaIO_3(aq) + 3H_2O(l)$$

Which of the statements about the reaction is **false**?

☒ **A** The oxidation number of some iodine atoms goes up.

☒ **B** At high temperatures NaIO(aq) also forms.

☒ **C** Sodium ions are spectator ions.

☒ **D** The oxidation number of some iodine atoms goes down.

(Total for Question = 1 mark)

18 When aqueous solutions of barium chloride and potassium sulfate are mixed, a white precipitate forms. The ionic equation for the reaction is

☒ **A** $K^+(aq) + Cl^-(aq) \rightarrow KCl(s)$

☒ **B** $K^{2+}(aq) + 2Cl^-(aq) \rightarrow KCl_2(s)$

☒ **C** $Ba^+(aq) + SO_4^-(aq) \rightarrow BaSO_4(s)$

☒ **D** $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

(Total for Question = 1 mark)

19 When 0.635 g of copper (relative atomic mass, RAM = 63.5) is added to an excess of silver nitrate solution, 2.158 g of silver (RAM = 107.9) form. The ionic equation for the reaction is

☒ **A** $Cu(s) + Ag^{2+}(aq) \rightarrow Cu^{2+}(aq) + Ag(s)$

☒ **B** $Cu(s) + Ag^{+}(aq) \rightarrow Cu^{+}(aq) + Ag(s)$

☒ **C** $2Cu(s) + Ag^{2+}(aq) \rightarrow 2Cu^{+}(aq) + Ag(s)$

☒ **D** $Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$

(Total for Question = 1 mark)

20 The oxidation number of sulfur in thiosulfate ions, $S_2O_3^{2-}$, is

☒ **A** +2

☒ **B** +3

☒ **C** +4

☒ **D** +6

(Total for Question = 1 mark)

21 Which of the following is a redox reaction?

☒ **A** $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

☒ **B** $MgO + H_2O \rightarrow Mg(OH)_2$

☒ **C** $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

☒ **D** $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$

(Total for Question = 1 mark)

PhysicsAndMathsTutor.com

22 What is the oxidation number of oxygen in OF_2?

☒ **A** - 2

☒ **B** - 1

☒ **C** +1

☒ **D** +2

(Total for Question 1 mark)

23 In which of the following reactions is sulfuric(IV) acid, H_2SO_3, acting as an oxidizing agent?

☒ **A** $2NaOH + H_2SO_3 \rightarrow Na_2SO_3 + 2H_2O$

☒ **B** $2FeCl_3 + H_2SO_3 + H_2O \rightarrow 2FeCl_2 + H_2SO_4 + 2HCl$

☒ **C** $2H_2S + H_2SO_3 \rightarrow 3H_2O + 3S$

☒ **D** $H_2SO_3 \rightarrow H_2O + SO_2$

(Total for Question 1 mark)

24 For the oxidation of ammonia

$$a\ NH_3 + b\ O_2 \rightarrow c\ NO + d\ H_2O$$

the values of the coefficients in the balanced equation are

☒ **A** a= 2, b= 3, c= 2 and d= 3

☒ **B** a= 4, b= 7, c= 4 and d= 4

☒ **C** a= 4, b= 5, c= 4 and d= 6

☒ **D** a= 6, b= 7, c= 6 and d= 9

(Total for Question 1 mark)

PhysicsAndMathsTutor.com

25 Chemical reactions may involve

A oxidation

B reduction

C no change in oxidation number

D disproportionation

Which of the terms above best describes what happens to the **chlorine** in the following reactions?

(a) $Cl_2(g) + H_2O(l) \rightarrow HCl(aq) + HOCl(aq)$

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) $_2(g) + 2Na(s) \rightarrow 2NaCl(s)$

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(c) $NaCl(s) + H_2SO_4(l) \rightarrow HCl(g) + NaHSO_4(s)$

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(Total for Question = 3 marks)