545/1

S4 CHEMISTRY

Exam 12 marking guide

PAPER 1

DURATION: 1 hour 30 minutes

Instructions:
Attempt all question by shading or ticking in the corresponding box

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A															
B															
C															
D															

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A															
B															
C															
D															

	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
A															
B															
C															
D															

	46	47	48	49	50
A					
B					
C					
D					

1. Which one of the following salts when in solution will form a white precipitate with acidified barium nitrate solution?
   A: Na_2SO_3 B: $ZnCl_2$ **C:** $CuSO_4$ D: Na_2CO_3

2. During the extraction of sodium by the electrolysis of sodium chloride, the role of calcium chloride is to
   A: prevent oxidation of sodium
   B: lower the melting point of sodium chloride
   C: purify the sodium chloride
   D: catalyse the reaction.

3. A 0.2M solution of X contains 18.25g of X per litre of the solution. The relative molecular mass of X is
   A: 18.25 B: 45.63 **C:** 91.25 D: 36.50
   0.2molesof X contain 18.25 g
   1mole of X contain $\frac{18.25\ x\ 1}{0.2} = 91.25$

4. Which one of the following is normally used as a catalyst in the manufacture of sulphuric acid by the contact process?
   A: iron B: manganese (IV) oxide
   C: platinum **D:** vanadium (V) oxide

5. Which one of the following substance can be purified by sublimation?
   A: iron (III) chloride B: phosphorus
   C: sulphur D: sodium chloride
   Iron III chloride sublimes
6. Lead (II) sulphate can be prepared by the action of dilute sulphuric acid on
   A: lead (II) carbonate B: lead metal
   C: lead (II) chloride **D:** lead (II) nitrate

7. On complete combustion, one mole of butane, C_4H_{10}, produces 2800kJ of heat energy. The mass, in grams of butane, which will produce 900kJ of heat energy is
   A: 58.0 B: 3.0g **C:** 18.6 D: 0.3
   Formula mass of butane, C_4H_{10} = 4 x 12 + 1 x 10 = 58
   2800kJ require 58kJ
   900kJ require $\frac{58\ x\ 900}{2800}$ =18.6
8. Which one of the following cat ions when in solution reacts with aqueous potassium hydroxide to form a green precipitate?
   A: Pb^{2+} **B:** Fe^{2+} C: Fe^{3+} D: Zn^{2+}

9. Carbon monoxide can be obtained from carbon dioxide by
   A: heating a mixture of carbon dioxide and steam
   B: reacting magnesium with carbon dioxide
   C: passing carbon dioxide overheated copper
   D: passing carbon dioxide overheated coke

10. Which one of the following dissolves in water to give a solution with a pH less than seven?
    A: NH_4Cl B: Na_2CO_3 C: CH_3COONa D: NaCl
    NH_4^+ hydrolyze (reacts) in water to produce hydrogen ion
    $NH_4+ (aq) \rightarrow NH_3 (aq) + H^+(aq)$
11. Copper (II) nitrate solution reacts with potassium iodide solution to form a
    A: yellow precipitate **B:** brown precipitate
    C: white precipitate D: green solution
    It actually a white ppt in brown solution
    $2Cu^{2+}(aq) + 4I^-(aq) \rightarrow Cu_2I_2(s) + I_2 (aq)$
12. Which one of the following methods can be used to extract magnesium from its ore?
    A: crystallization B: decomposition by heat
    C: Electrolysis D: reduction with carbonmonoxide
13. An atom of an element has the structure $^{40}_{18}X$. The element.
    A: Forms covalent bonds readily with non metals
    B: forms ionic bonds with non-metal
    C: belongs to group II of the periodic table
    D: has a full shell of electrons

    X – 2:8:6
14. Which one of the following reactions does not take place in the extraction of iron in the blast furnace?
    A: coke burns in air to form carbon dioxide
    B: limestone reduces iron (II) oxide to iron
    C: limestone decomposes to form calcium oxide
    D: carbonmonoxide reduces iron (II) oxide to iron

15. Which one of the following is produced at the cathode when a dilute solution of potassium chloride is electrolysed using carbon electrodes?
    A: chlorine B: oxygen C: potassium **D:** hydrogen.
    H+ being lower than K+ in electrochemical series ids preferentially discharged
    $2H^+(aq) + 2e \rightarrow H_2(g)$
16. The mass of nitric acid (HNO_3) required to make $200cm^3$ of a 2M solution is
    A: 31.5 B: 15.8g C: 12.6g **D:** 25.2g
    formula mass of nitric acid, HNO3 = 1 + 14 + 16 x 3 = 63
    Moles of nitric acid = $\frac{200\ x\ 2}{1000}$ = 0.4 moles
    Mass of nitric acid = 0.4 x 63 =25.2g

17. Which one of the following nitrates gives off brown fumes when heated?
    A: $AgNO_3$ B: $NaNO_3$ C: KNO_3 D: NH_4NO_3
    $2AgNO_3 \rightarrow 2Ag (s) + 2NO_2 (g) + O_2(g)$
18. Barium carbonate reacts with dilute hydrochloric acid according to the following equation
    $BaCO_3(s) + 2HCl (aq) \longrightarrow BaCl_2 (aq) + H_2O (l) + CO_2 (g)$
    The maximum volume of carbon dioxide that would be evolved on reacting 2.0g of barium carbonate with excess dilute hydrochloric acid at stp is: (BaCO3 = 197)

A: 448cm^3 **B:** 227cm^3 C: 224cm^3 D: 112cm^3

197g of $BaCO^3$ produce 22.4dm^3

2g of $BaCO^3$ produce $\frac{2\ x\ 22.4}{197}\ x\ 1000 = 227cm^3$

19. Concentrated nitric acid was added to an aqueous solution of iron (II) sulphate. What is observed?

A: green solution B: A green precipitate

C: pale yellow solution D: a brown ring

A green solution of iron II sulphate is oxidized to yellow Iron III salt

20. When testing for a sulphate, dilute nitric acid is added before barium nitrate in order to

A: catalyse the reaction **B:** eliminate any sulphite or carbonate

C: change the sulphate to a sulphite D: acidify the medium for reaction

Sulphite and carbonates of barium dissolve in nitric acid but the sulphate does not

21. Which one of the following observations would be made if a clean zinc granules is added to copper (II) sulphate solution?

A: granules would dissolve and blue solution would fade

B: granules would dissolve and a colourless solution formed

C: granules would dissolve, a blue solution maintained and a brown solid formed.

D: granules would dissolve and no colour change would occur.

Cu^{2+} are displaced by zinc

$Cu^{2+} + Zn\ (s) \rightarrow Cu(s) + Zn^{2+}(aq)$

22. Which one of the following solutions would form a precipitated when heated?

A: calcium hydrogen carbonate B: ammonium carbonate

C: sodium hydrogen carbonate D: potassium hydrogen carbonate

Calcium hydrogen carbonate decomposes to insoluble calcium carbonate

$Ca(HCO_3)_2\ (aq) \rightarrow CaCO_3(s) + CO_2(g) + H_2O(l)$

23. Which one of the following hydrocarbons has multiple bonds?

A: C_2H_6 B: C_3H_8 C: CH_4 **D:** C_2H_4

24. The following ions when reacted with sodium hydroxide form a white precipitate soluble in excess forming a colourless solution except:

A: Cu^{2+} B: Pb^{2+} C: Zn^{2+} D: $Al^{3+}(aq)$

Cu^{2+} forms a blue ppt. dissolve to form a blue solution

25. Sulphuric acid reacts with zinc according to the equation:

$Zn(s) + H_2SO_4\ (aq)$ $ZnSO_4\ (aq) + H_2\ (g)$

Determine the number of moles of zinc that will react with excess Sulphuric acid to produce 60cm^3 of hydrogen at room temperature?

A: 0.0025 B: 0.005 C: 0.025 D: 0.05

22.4dm^3 of hydrogen are produced by 1 mole of Zn

60cm^3 of hydrogen are produced by $\frac{60}{22.4\ x\ 1000}$ = 0.0025 moles

26. Hydrogen sulphide is formed by reacting dilute hydrochloric acid with

A: Ammonium sulphate B: sodium sulphite

C: calcium phosphate **D:** iron (II) sulphide

$FeS + 2H^+(aq) \rightarrow Fe^{2+}(aq) + H_2S(g)$

27. Which of the following is a constituent of a compound, which reacts with concentrated Sulphuric acid producing a gas which fumes with ammonia?
A: carbonate **B:** chloride C: oxide D: nitrate
Chlorides produce HCl that forms a white ppt. of white ppt.
$NH_3(g) + HCl(g) \rightarrow NH_4Cl\ (s)$

28. In which of the following processes is electrolysis applied?
A: manufacture of sodium hydroxide
B: refining of crude oil
C: vulcanization of rubber
D: extraction of iron

29. Which one of the following reagents is used to test for sulphur dioxide?
A: cobalt chloride B: chlorine water
C: anhydrous copper sulphate **D:** Acidified potassium permanganate
Sulphur dioxide decolorizes acidified potassium permanganate

30. Fractional crystallization can be used to separate a mixture in solution. The substances in the mixture must have
A: very low boiling points B: very high molecular masses
C: a large difference in solubility D: a hygroscopic property

In each of the questions 31 to 40 one or more of the answers given may be correct. Read each question carefully and then indicate the correct answer according to the following:
A: If 1, 2, 3 only are correct
B: if 1, 3 only are correct
C: if 2, 4 only are correct
D: if 4 only is correct

31. Nitrogen can react with hydrogen to produce ammonia according to the following equation:
$N_2\ (g) + 3H_2\ (g) \longrightarrow 2NH_3\ (g)$: DH = – 92.0 kJmol $^{-1}$
The condition(s) that would favour the formation of ammonia is/are
1. high temperature
2. high pressure
3. low pressure
4. low temperature

C

32. In which of the following ways is carbon similar to sulphur? Both
1. exist in allotropic forms
2. form covalent compounds
3. are non-metallic solids
4. form neutral oxides

B

33. Which of the following substance(s) is/are commonly used to convert brown sugar to white sugar?
    1. Animal charcoal
    2. sodium hypochlorite
    3. sulphur dioxide
    4. bleaching powder

B

34. Which of the following when electrolysed between platinum electrodes will produce water and hydrogen?
    1. sodium chloride solution
    2. acidified water
    3. Potassium chloride solution
    4. copper (II) sulphate solution

B

Hydrogen is produced at the cathode and water and oxygen at the anode when the solutions are dilute.

35. The hydroxide(s) which is/are soluble in excess ammonia solution is/are
    1. aluminium hydroxide
    2. copper (II) hydroxide
    3. lead (II) hydroxide
    4. zinc hydroxide

C

36. Hydrogen bromide in aqueous solution shows the following characteristics except
    1. liberates carbon dioxide from carbonates
    2. produces hydrogen with electro-positive metals
    3. turns litmus solution red
    4. Behaves as a strong oxidizing agent.

A

37. A white precipitate was formed when an aqueous solution of a salt was reacted with aqueous barium nitrate. The white precipitate dissolved in nitric acid. The anion in the salt is:

    1. Cl^- 2. SO_4^{2-} 3. NO_3^- 4. SO_3^-

C

38. In which of the following process(es) does oxidation occur?
    1. burning of biogas
    2. smoldering of phosphorus
    3. rusting of iron
    4. melting of candle wax.

B

39. Dilute nitric acid reacts with copper to produce
    1. copper nitrate, water and nitrogen dioxide
    2. copper nitrate, ammonia and water
    3. copper nitrate, water and hydrogen
    4. copper nitrate, water and nitrogen monoxide

D

40. Which of the following contains the same volume as 8.0g of oxygen at s.t.p?
    1. 0.5g of hydrogen
    2. 22.0g of carbon dioxide
    3. 7g of nitrogen
    4. 17g of ammonia.

B

Each of the questions 41 – 50 consists of an assertion (statement) on the left hand side and a reason on the right hand side.
Select:
A: If both the assertion and the reason are true statements and the reason is a correct Explanation of the assertion
B: If both the assertion and the reason are true statements but the reason is not the correct Explanation of the assertion
C: If the assertion is true but the reason is not a correct statement
D: if the assertion is not correct but the reason is a true statement.

Instructions summarized	
Assertion	Reason
A: True	Tue (reason is a correct explanation)
B: true	True (reason not the correct explanation)
C: true	Incorrect
D: incorrect	True

41. Excessive use of detergents for laundry could cause environmental concerns — because — all detergents are soluble in water — B
42. smoke particles in a smoke cell are in continuous motion — because — smoke particles collide with air particles — A
43. Electrolysis of dilute Sulphuric acid between platinum electrodes produces oxygen at the anode — because — Hydrogen ions are preferentially discarchaged — A
44. Rhombic sulphur is stable only at a temperature below 96^{o}C — because — its atoms are arranged in a layer structure — C
45. wrought iron is made by heating cast iron with hematite — because — hematite oxidizes most of the impurities in pig iron to gaseous oxides — A

Wrought iron or malleable iron is the purest form of commercial iron and is prepared from cast iron by oxidizing impurities in a reverberatory furnace lined with haematite. The haematite oxidizes carbon to carbon monoxide:
$Fe_2CO_3+3C \rightarrow 2Fe+3CO$

46. iodine is formed when chlorine gas is bubbled into a solution of potassium iodide — because — chlorine gas reduces the iodide ions into the solution — C

47. Sulphuric acid is a weak dibasic acid	because	Sulphuric acid strongly ionizes completely.	D
48. When ethane burns air, it produces a smoky flame	because	of the presence of un burnt carbon	A
49. barium nitrate solution is used to test for the presence of chloride ions in solution	because	barium chloride is soluble in water	D
50. chlorine water bleaches wet dyes	because	hypochlorous acid supplies the oxygen to wet dyes	A

Thank you
Dr. Bbosa Science