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CHEMISTRY COMPETITON

(2019 EDITION)

MARKING GUIDE

OBJECTIVES

1	A
2	D
3	C
4	B
5	D
6	A
7	D
8	D
9	B
10	D
11	B
12	B
13	C
14	B
15	D
16	D
17	B
18	B
19	D
20	D
21	C
22	A
23	C
24	B
25	B

26	B
27	D
28	B
29	B
30	C
31	B
32	C
33	C
34	B
35	A
36	D
37	B
38	A
39	A
40	A
41	D
42	A
43	D
44	D
45	D
46	A
47	C
48	D
49	A
50	C

Each correct answer attracts (1) mark

Total = 50marks

THEORY

QUESTION 1

1ai Hydrogen gas. (**do not accept H_2**) **1mark**

1aii $2HCl_{(aq)} + Fe_{(s)} \rightarrow FeCl_{2(aq)} + H_{2(g)}$ **2marks**

1aiii insert a glowing splinter in a jar containing the gas**.(1mark)** A "pop" sound indicates the presence of hydrogen gas (**1mark)**

1aiv The solution changes from green (**1mark)** to reddish brown.
(1marks)

1bi The reaction will proceed faster (**1mark)**

Bii No visible reaction **(1mark)**

Biii No visible reaction
(1mark)

Total marks obtainable for question 1 = 10marks

QUESTION 2

2ai The lead cup would be rejected **(1mark)**

2aii The silver cup would be used **(1mark)**

2aiii lead is more electropositive than copper, hence it would displace copper from copper salt solution. Hence the lead cup would be rejected. However, the silver, being less electropositive that copper, it will not displace copper from its salt. Hence, the silver cup will be used
(2marks)

2aiv $CuSO_{4(aq)} + Pb_{(s)} \rightarrow PbSO_{4(aq)} + Cu_{(s)}$ **(2mark)**

2a v The solution would change from blue to colourless/ a brown residue of copper is observed **(1marks)**

2b $_{21}Sc^{+3}$ $1s^2 2s^2 2p^6 3s^2 3p^6$ **(1mark)**

$_{29}Cu$ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$ **(1mark)**

$_{29}Cu^{+}$ $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$ **(1mark)**

Total marks obtainable in question 2 = (10 marks)

QUESTION 3

3ai rate = $\frac{\Delta volume}{time}$ **$\frac{1}{2}$ mark**

Time = $2\ X\ 60\ X\ 60$= 7200s (conversion of time to seconds) **$\frac{1}{2}$ mark**

Rate-$\frac{44800-11200}{7200s}$ **$\frac{1}{2}$ mark**

Rate = 4.67 cm^3/s **$\frac{1}{2}$ mark**

3b $C_8H_{18(l)} + \frac{25}{2} O_{2(g)} \rightarrow 8CO_{2(g)} + 9H_2O_{(g)}$ **2marks**

$2C_8H_{18(l)} + 25O_{2(g)} \rightarrow 16CO_{2(g)} + 18H_2O_{(g)}$

3c

$$\frac{volume}{molar\ volume} = \frac{mass}{molar\ mass}$$

$\frac{33600\ cm3}{22400cm3} = \frac{mass}{114g/mol}$ **1mark**

Mass of C_8H_{18}= 171g

Or any other method

$2C_8H_{18(l)} + 25O_{2(g)} \rightarrow 16CO_{2(g)} + 18H_2O_{(g)}$

3c

From the equation, 228g of C_8H_{18} produces 704g of CO_2

The mass of CO_2 that would be produced from 171g

=$\frac{704\ X\ 171}{228}$ **1mark**

=528g **1mark with unit (no unit, no mark)**

3d

Hydrogen is preferred to carbon fuel because it does not produce green house gas/ cheaper/ more readily available **1mark**

3e

The bonds in ammonium chloride are;

i. covalent bond (in the formation of ammonia from nitrogen and hydrogen)

ii. dative or coordinate covalent bond in the formation of ammonium ion from ammonia

and hydrogen ion

ii. electrovalent/ionic bond from the combination of ammonium ion and chloride ion (**any correct 2 X 1mark = 2marks**

Total marks obtainable in question 3 = (10 marks)

QUESTION 4

a

I.	B	**1mark**
II.	A	**1mark**
III.	C	**1mark**
IV.	D	**1mark**

4bi. Acids are proton donor/ any substance that donates a proton in a chemical reaction **1mark**

ii ideal gas obeys gas laws at all temperature and pressure while real gases only obey gas laws at high pressure and low temperature **2marks**

iii

$\frac{Rate\ of\ SO2}{Rate\ of\ CH4} = \sqrt{\frac{rmm\ of\ CH4}{rmm\ of\ so2}}$ **1mark**

$= \frac{300Cm3}{30}$

$\frac{\frac{300cm3}{30s}}{\frac{100cm}{x}} = \sqrt{\frac{16}{64}}$ **1mark**

$\frac{\frac{300cm3}{30s}}{\frac{100cm}{x}} = \frac{1}{2}$

X= 5seconds **1mark**

Total marks obtainable in question 4 = (10 marks)

Question 5

a)i close difference in boiling point **(1mark)**

ii steam and coke or steam and methane . **2marks**

5b

I. $_{11}A\ _{13}D\ _{15}C\ _{17}B$ **(1mark)**

II. Any value greater than 700kj/mol **(1mark)**

5c

I. A and C **(1mark)**

II. D **(1mark)**

III. A and C $\frac{1}{2}$ **mark**

IV. Ethyne **(1mark)**

(1mark)

Total marks obtainable in question 5 = (10 marks)

Analysis of marks

Objective	**50 marks**
Question 1	**10 marks**
Question 2	**10 marks**
Question 3	**10 marks**
Question 3	**10 marks**
Question 5	**10 marks**
Total	**100marks**

50