Science Olympiad Foundation Uganda

Uganda National Chemistry Olympiad - Grandfinal

Exam ID: 128

Name: _____

Date: _____

Question: 1 of 22 QID: 331 Marks: 1

Which does not increase rate by affecting the number or nature of collisions?

Please mark (✓) for the correct answer.

- ◯ **A.** adding a catalyst
- ◯ **B.** increasing the pressure
- ◯ **C.** increasing the surface area
- ◯ **D.** increasing the temperature

Question: 2 of 22 QID: 330 Marks: 8

The most common ingredient in window cleaner is ammonia, often in high concentrations. For dilute ammonia samples, the amount of ammonia in a given window cleaner can be determined using a titration of the ammonia weak base with a strong acid. Suppose you have a 10.000 g sample of window cleaner containing ammonia which you first dilute with 90.012 g of water. You then take 5.000 g of solution and titrate it with 42.11 mL of 0.05042 M HCl to reach a bromocresol green end point.

Find the weight percent of NH_3 in the cleaner.

Please write your answer below.

Question: 3 of 22 QID: 329 Marks: 1

At a constant temperature, an ideal gas is compressed from 6.0 liters to 4.0 liters by a constant external pressure of 5.0 atm. How much work is done on the gas?

Please mark (✓) for the correct answer.

- **A.** w = +10 liter atm
- **B.** w = -10 liter atm
- **C.** w = +30 liter atm
- **D.** w = -30 liter atm
- **E.** The answer cannot be calculated.

Question: 4 of 22 QID: 328 Marks: 1

What will be the work done by 3 moles of an ideal gas when it expands spontaneously in a vacuum?

Please mark (✓) for the correct answer.

- **A.** zero
- **B.** infinite
- **C.** 3 joules
- **D.** 9 joules

Question: 5 of 22 QID: 327 Marks: 1

What is the function of a catalyst in a chemical reaction?

Please mark (✓) for the correct answer.

- **A.** decrease rate constant of reaction
- **B.** increases activation energy of reaction
- **C.** reduces enthalpy of reaction
- **D.** does not affect the equilibrium constant of reaction

Question: 6 of 22 QID: 326 Marks: 1

Which reaction is not used to make a Hess cycle for the following reaction?

$C_2H_4(g) + H_2O(l) \rightarrow C_2H_5OH(l)$

Please mark (✓) for the correct answer.

- **A.** ΔfH ethanol
- **B.** ΔcH ethene
- **C.** ΔcH hydrogen
- **D.** ΔfH ethene

Question: 7 of 22 QID: 325 Marks: 1

Use the bond enthalpies to determine the ΔcH for methane

Bond	Bond enthalpy (kJ mol^{-1})
C–C	350
C=C	611
C=O	732
C–O	350
C–H	410
O–H	460
O=O	498

Please mark (✓) for the correct answer.

- **A.** –1664 kJ mol–1
- **B.** –744 kJ mol–1
- **C.** –668 kJ mol–1
- **D.** +252 kJ mol–1

Question: 8 of 22 QID: 324 Marks: 1

15 g of octane is burned and used to heat 50 cm^3 of water by 15°C. What is the amount of energy transferred to the water? Assume a water density of 1 g cm^{-3} and a specific heat capacity of 4.18 J g^{-1} K^{-1}.

Please mark (✓) for the correct answer.

- **A.** 940.5 J
- **B.** 3135 J
- **C.** 940.5 kJ
- **D.** 3135 kJ

Question: 9 of 22 QID: 323 Marks: 1

15 g of octane is burned and used to heat 50 cm^3 of water by 15°C. What is the amount of energy transferred to the water? Assume a water density of 1 g cm^{-3} and a specific heat capacity of 4.18 J g^{-1} K^{-1}.

Please mark (✓) for the correct answer.

- **A.** 940.5 J
- **B.** 3135 J
- **C.** 940.5 kJ
- **D.** 3135 kJ

Question: 10 of 22 QID: 322 Marks: 1

Which is the equivalent to the formation of carbon dioxide?

Please mark (✓) for the correct answer.

- **A.** combustion of hydrogen(g)
- **B.** complete combustion of carbon(s)
- **C.** complete combustion of propane(l)
- **D.** incomplete combustion of propane(g)

Question: 11 of 22 QID: 321 Marks: 1

Which of the following is not a standard condition?

Please mark (✓) for the correct answer.

- ◯ **A.** 298 K
- ◯ **B.** 100 kPa
- ◯ **C.** 100 atm
- ◯ **D.** 1 mol dm–3 solutions

Question: 12 of 22 QID: 320 Marks: 4

The temperature of a given gas is −10°C. What are the equivalent Fahrenheit and absolute Kelvin scales? **(4 marks)**

Please write your answer below.

Question: 13 of 22 QID: 412 Marks: 6

Identify the total number of unpaired electrons in the 3d and 4s orbitals of each isolated gaseous atom below. **(6 marks)**

1. Cr
2. Mn
3. Fe

Please write your answer below.

Question: 14 of 22 QID: 413 Marks: 2

Solid potassium manganate (VII), $KMnO_4$, decomposes on heating to form manganese (IV) oxide, potassium manganate (VI) and a colourless gas. Construct an equation for this reaction **(2 marks)**

Please write your answer below.

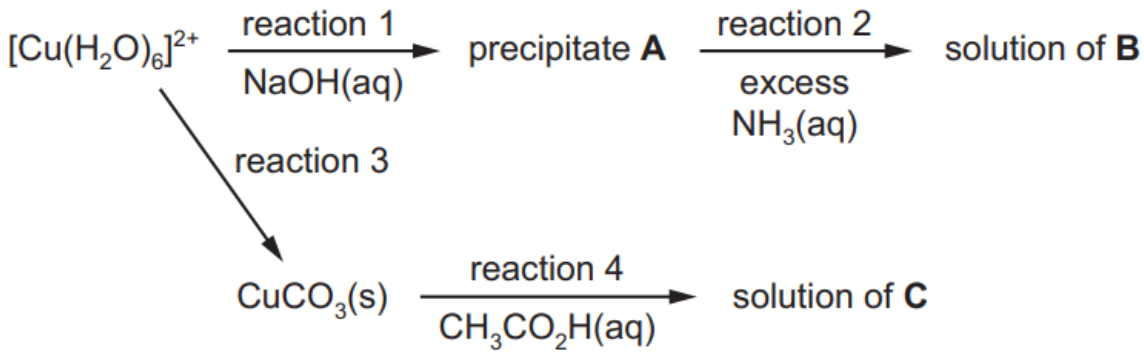
Question: 15 of 22 QID: 414 Marks: 3

Explain the origin of colour in transition element complexes **(3 marks)**

Please write your answer below.

Question: 16 of 22 QID: 415 Marks: 3

The reaction scheme shows some reactions of $[Cu(H_2O)_6]^{2+}$.



Write the formulae of

- precipitate A **(1 mark)**
- complex ion B **(1 mark)**
- compound C **(1 mark)**

Please write your answer below.

Question: 17 of 22 QID: 416 Marks: 1

In respect to the same reaction scheme, identify a suitable reagent for reaction 3. **(1 mark)**

Please write your answer below.

Question: 18 of 22 QID: 417 Marks: 2

In respect to the same reaction scheme, write an equation for reaction 4 **(2 marks)**

Please write your answer below.

Question: 19 of 22 QID: 418 Marks: 2

In respect to the same reaction scheme, describe two visual observations that would be made during reaction 4 **(2 marks)**

Please write your answer below.

Question: 20 of 22 QID: 419 Marks: 1

Platin, $Pt(NH_3)_2Cl_2$, is a neutral complex of platinum (II). Explain why $Pt(NH_3)_2Cl_2$ has no charge. **(1 mark)**

Please write your answer below.

Question: 21 of 22 QID: 420 Marks: 2

$Pt(NH_3)_2Cl_2$, displays cis-trans isomerism.

On a rough paper, draw the structure of trans-platin. State its shape and the Cl–Pt–Cl bond angle. **(2 marks)**

Please write your answer below.

Question: 22 of 22 QID: 421 Marks: 2

Cis-platin is an effective anti-cancer drug.

Describe the action of cis-platin in this role. **(2 marks)**

Please write your answer below.

--- END OF QUESTION PAPER ---

Answer Key

No	Question Type	QID	Correct Answer
Question - 1	Multiple Choice (Radiobutton)	331	A
Question - 2	Essay (Evaluted by Admin)	330	Essay Type Question
Question - 3	Multiple Choice (Radiobutton)	329	A
Question - 4	Multiple Choice (Radiobutton)	328	A
Question - 5	Multiple Choice (Radiobutton)	327	D
Question - 6	Multiple Choice (Radiobutton)	326	B
Question - 7	Multiple Choice (Radiobutton)	325	C
Question - 8	Multiple Choice (Radiobutton)	324	B
Question - 9	Multiple Choice (Radiobutton)	323	B
Question - 10	Multiple Choice (Radiobutton)	322	B
Question - 11	Multiple Choice (Radiobutton)	321	C
Question - 12	Essay (Evaluted by Admin)	320	Essay Type Question
Question - 13	Essay (Evaluted by Admin)	412	Essay Type Question
Question - 14	Essay (Evaluted by Admin)	413	Essay Type Question
Question - 15	Essay (Evaluted by Admin)	414	Essay Type Question
Question - 16	Essay (Evaluted by Admin)	415	Essay Type Question
Question - 17	Essay (Evaluted by Admin)	416	Essay Type Question
Question - 18	Essay (Evaluted by Admin)	417	Essay Type Question
Question - 19	Essay (Evaluted by Admin)	418	Essay Type Question
Question - 20	Essay (Evaluted by Admin)	419	Essay Type Question
Question - 21	Essay (Evaluted by Admin)	420	Essay Type Question
Question - 22	Essay (Evaluted by Admin)	421	Essay Type Question

--- END OF ANSWER KEY ---