## G12 IBDP SL CHEMISTRY MOCK EXAM 2016

Refer to only Periodic Table. No calculators.

Duration: 45 mins Marks : 30 m

- 1. How many neutrons are present in 0.12g of <sup>12</sup>C? (where L is the Avogadro constant]
  - A. 0.05 L
  - B. 0.06 L
  - C. 0.02 L
  - D. 0.12 L

2. Which of these samples of gas contains the same number of atoms as 2 g of hydrogen?

- A. 44 g of carbon dioxide
- B. 16 g of methane
- C. 40 g of neon
- D. 32 g of oxygen
- 3. Which of the following gases exerts the highest pressure?
  - A. 1 mol of  $H_2$  with a volume of 1dm<sup>3</sup> at 27<sup>o</sup><sub>C</sub>
  - B. 2 mol of  $N_2$  with a volume of 0.5dm<sup>3</sup> at 57°<sub>C</sub>
  - C. 1 mol of CO with a volume of  $1 \text{dm}^3$  at  $27^{\circ}_{\text{C}}$
  - D. 2 mol of  $CO_2$  with a volume of 1dm<sup>3</sup> at 27<sup>o</sup><sub>C</sub>
- 4. Which one of the following determines how an element has been positioned in the Periodic Table?
  - A. Mass number
  - B. First ionization energy
  - C. Electronegativity
  - D. Proton Number
- 5. Which of the following electronic configurations represents an element that forms an ion with a -3 charge?
  - A.  $1s^22s^22p^63s^23p^4$
  - B.  $1s^22s^22p^63s^23p^3$
  - C.  $1s^22s^22p^63s^23p^63d^34s^2$
  - D.  $1s^22s^22p^63s^23p^13d^24s^2$

- 6. Which electronic transition of the hydrogen emission spectrum releases the least energy?
  - A.  $n = 1 \rightarrow n = 2$
  - B. n = 8 → n = 7
  - C.  $n = 4 \rightarrow n = 2$
  - D.  $n = 9 \rightarrow n = 1$
- 7. Which one of the following has the largest radius?
  - A. Phosphide ion
  - B. Chloride
  - C. Neon
  - D. Potassium ion
- 8. Which of the following dissolves in water to produce the lowest pH?
  - A. CO<sub>2</sub>
  - B. SiO<sub>2</sub>
  - $C. \quad Cl_2O_7$
  - $D. \ P_4O_{1o}$
- 9. A mixture of two oxides from period 3 is dissolved in water to produce a neutral solution. What could be the components of the mixture?
  - A. Na<sub>2</sub>O and MgO
  - B. Na<sub>2</sub>O and  $P_4O_{10}$
  - $C. \quad Cl_2O_7 \text{ and } CO_2$
  - D.  $SO_3$  and  $CO_2$
- 10. Which of the type of bond needs to broken for magnesium oxide to melt?
  - A. Dative co-ordinate
  - B. Ionic Bonds
  - C. Metallic
  - D. Covalent

- 11. Which of the following explains why copper wire is able to conduct electricity when a potential difference is applied?
  - A. The copper (II) ions are able to move and behave like charge carriers.
  - B. The copper atoms are able to move and behave like charge carriers.
  - C. The copper atoms become ionized.
  - D. Sea of delocalized electrons are able to move and behave like charge carries.
- 12. What is the bond angle of the carbon oxygen bond in carbon dioxide?
  - A. 120°
  - B. 180<sup>0</sup>
  - C. 109.5°
  - D.  $104.5^{\circ}$
- 13. Given the following enthalpy changes of combustion :

$CO(g) + 0.5 O_2(g) \rightarrow CO_2(g)$	$\Delta H_c^{\theta} = -x$
H2 (g) + 0.5 O <sub>2</sub> (g) → H <sub>2</sub> O (I)	$\Delta H_c^{\theta} = -y$
CH <sub>3</sub> OH (I) + 1.5 O <sub>2</sub> (g) → CO <sub>2</sub> (g) + 2H <sub>2</sub> O	$\Delta H_c^{\theta} = - z$

What is the enthalpy change of the following reaction?

 $2H_2(g) + CO(g) \rightarrow CH_3OH(I)$ 

- A. (-x) + 2(-y) (-z)
- B. (x) + 2(-y) (-z)
- C. (-x) + 2(y) + (-z)
- D. (x) + 2(-y) + (z)

14. The energy diagram below represents the energy changes that occur with and without a catalyst for a particular reaction.



Identify the correct statement out of the following:

- A. The forward reaction with or without catalyst is endothermic.
- B. The enthalpy change of the reaction  $E_1 E_3$
- C. The use of catalyst lowers the enthalpy change of the reaction.
- D.  $E_1$  is the activation energy of the catalysed backward reaction.
- 15. The Boltzmann distribution of the speeds of the molecules of a gas diagram is represented below.In which direction does point X change when the gas is heated?



- 16. Based on the definition of the rate of reaction, state the units of the rate of a reaction?
  - A.  $mol^{-1} dm^3$
  - B. s
  - C. s<sup>-1</sup>
  - D. mol dm<sup>-3</sup> s<sup>-1</sup>

17. The equilibrium constant Kc for the reaction A (g) + B (g)  $\leftarrow$  C (g) is found to have the following relationship with temperature T as reflected in the diagram below.



Which of the following conclusions can be obtained from the diagram above?

- A. The reaction is endothermic is the forward direction
- B. The reaction is exothermic in the backward direction
- C. At high temperatures, the products are in higher concentrations than reactants.
- D. At low temperatures, the products are in higher concentrations than reactants.
- 18. Which one of the following statements about the manufacture of ammonia through the Haber process is true?
  - A. The catalyst used increases the percentage yield of ammonia produced.
  - B. A low temperature is used as the forward reaction is exothermic
  - C. A low pressure is used as there are more gaseous molecules on the product side.
  - D. The product yield is dependent on the amount of catalyst added.
- 19. Which one of following correctly describes the components of ammonia solution in water?
  - A. Only simple molecules.
  - B. Simple molecules and hydrogen-bonded molecules.
  - C. Simple molecules, hydrogen-bonded molecules and ions.
  - D. Hydrogen bonded molecules and ions.
- 20. Which one of the following describes Bronstead-Lowry acid behavior of ammonia?
  - A.  $NH_3$  (I) + Li (s)  $\rightarrow$  ( $NH_2$ )<sup>-</sup> Li<sup>+</sup> + 0.5 H<sub>2</sub>
  - B.  $6NH_3$  (I) + Cu<sup>2+</sup> (aq)  $\rightarrow$  [Cu (NH<sub>3</sub>)<sub>6</sub>]<sup>2+</sup>
  - C.  $NH_3(g) + H_2O(I) \rightarrow NH_4^+(aq) + OH^-(aq)$
  - D.  $NH_3$  (g) + HCl (aq)  $\rightarrow$   $NH_4Cl$  (aq)

- 21. Which one of the following is the correct equation describing acid rain formation?
  - A. NO (g) + H<sub>2</sub>O (l)  $\rightarrow$  H<sub>2</sub>NO<sub>2</sub> (aq)
  - B. CO (g) + H<sub>2</sub>O (I)  $\rightarrow$  H<sub>2</sub>CO<sub>2</sub> (aq)
  - C.  $SO_3 (g) + H_2O (I) \rightarrow H_2SO_4 (aq)$
  - D.  $Cl_2(g) + H_2O(I) \rightarrow HCI(aq) + HCIO(aq)$
- 22. An aqueous solution containing 4 mol of chlorine ( $Cl_2$ ) molecules are reduced by 1 mol of thiosulphate ( $S_2O_3^{2-}$ ) ions. What is oxidation state of sulfur in the final product of this reaction?
  - A. 0
  - B. +4
  - C. +6
  - D. +2
- 23. What is the maximum mass of magnesium metal formed at the cathode during the electrolysis of molten magnesium oxide when 4 mols of electrons are passed through the electrolytic system?
  - A. 12.15 g
  - B. 24.31 g
  - C. 48.62 g
  - D. 6.088 g
- 24. The following equations describe the Winkler method of obtaining the dissolved oxygen concentration in water.

 $2 \text{ Mn}(OH)_{2}(s) + O_{2}(aq) \rightarrow 2 \text{ Mn}O(OH)_{2}(s)$   $MnO(OH)_{2}(s) + 2H_{2}SO_{4}(aq) \rightarrow Mn(SO_{4})_{2}(s) + 3H2O(I)$   $Mn(SO_{4})_{2} + 2I^{-}(aq) \rightarrow Mn^{2+}(aq) + I_{2}(aq) + 2SO_{4}^{2-}(aq)$   $2 S_{2}O_{3}^{2-}(aq) + I_{2}(aq) \rightarrow S_{4}O_{6}^{2-}(aq) + 2I^{-}(aq)$ 

Calculate the amount of dissolved oxygen (in mol) given the volume of thiosulphate  $S_2O_3^{2-}$ needed for this reaction is 100 cm<sup>3</sup> from a concentration of 0.1 mol dm<sup>-3</sup>.

- A. 0.040 mol
- B. 0.0025 mol
- C. 0.250 mol
- D. 0.40 mol

25. Which one of the following hydrocarbon can decolourise aqueous bromine?

- A. C<sub>2</sub>H<sub>6</sub>
- B. C<sub>2</sub>H<sub>4</sub>
- C. C<sub>2</sub>H<sub>2</sub>
- D. C<sub>3</sub>H<sub>8</sub>

26. Which one of the following can be deduced when propan-2-ol undergoes reaction with acidified potassium dichromate under reflux?

- A. Propanoic acid is formed with a colour change from orange to green.
- B. Propanoic acid is formed with a colour change from green to orange.
- C. Propanone is formed with a colour change from orange to green.
- D. Propanone is formed with a colour change from green to orange.
- 27. Which one of the following is a substitution reaction?
  - A.  $CH_3CI + OH^- \rightarrow CH_3OH + CI^-$
  - B.  $CH_2CH_2 + H_2O \rightarrow C_2H_5OH$
  - C.  $CH_3COCH_3 + HCN \rightarrow CH_3C(OH)(CN)CH_3$
  - D.  $CH_2CH_2 + HCI \rightarrow C_2H_5CI$
- 28. The following table represents the use of a thermometer to measure the temperature rise for an exothermic reaction. What is the temperature rise?

	Temperature/ <sup>°</sup> C (± 0.1)
Initial Temperature	28.2
Final Temperature	40.1

- A. 11.9  $\pm$  0.2  $^{\circ}$  C
- B. 11.9 ± 0.1 ° C
- C. 11.9 °C
- D. None of the above

29. Which compound is represented by the following mass spectrum?



- A. Propyl Ethanoate
- B. Pentanol
- C. Ethyl Propanoate
- D. Ethanoic acid
- 30. How many <sup>1</sup>H NMR signals will be detected for the following compound :



- A. 3
- B. 4
- C. 5
- D. 6