2019 NHT Language Analysis Comparative Annotations
ASHA Lectures

TASK A – Multiple Choice Questions

Question 1

Which of the following fuels are non-renewable sources of energy?

A. I, II, III
B. II, IV, V
C. I, III, VI
D. III, V, VI

Question 2
2.00 tonnes of gasoline (C8H18; M = 114 g mol-1) was combusted at a temperature of 37° C and pressure of 1 atm according to the following equation.

$$2C_8H_{18}\,(l) + 25O_2(g) \rightarrow 16CO_2(g) + 18H_2O\,(g)$$

Assuming complete combustion occurred, the volume of carbon dioxide gas produced during the combustion process is closest to
(1 tonne = 1000 kg)

A. 4.3×10^7L B. 4.5×10^5L C. 3.6×10^6L D. 5.4×10^6L

Question 3
20.0 g of butane is combusted in excess oxygen at 25° C and 100kPa according to the following equation:

$$C_4H_{10}\,(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O\,(g)\ \Delta H = -2880\ kJ\ mol^{-1}$$

Assuming complete combustion, the amount of heat evolved would be:
A. 57,600 kJ
B. 993 kJ
C. 2880 kJ
D. 800 kJ

Question 4
Which one of the following orders the energy content (per gram of fuel) from highest to lowest?

A. Natural gas > Petroleum > Coal > Bioethanol
B. Natural gas > Bioethanol > Coal > Petroleum
C. Natural gas > Coal > Bioethanol > Petroleum
D. Coal > Bioethanol > Petroleum > Natural gas

The following information refer to questions 5 and 6

Consider the following simplified diagram of an alkaline fuel cell used in the Apollo program:

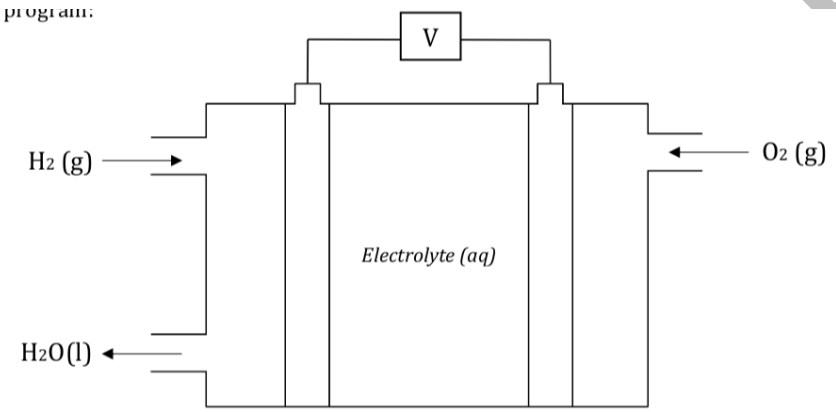


Figure 1

Question 5
Which of the following options show the correct half reactions taking place at the negative and positive electrodes of this cell?

	Negative electrode reaction	Positive electrode reaction
A.	$H_2(g) + 2OH^-(aq) \rightarrow 2H_2O(l) + 2e^-$	$O_2(g) + 2H_2O\ (l) + 4e^- \rightarrow 4OH^-(aq)$
B.	$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$	$H_2(g) \rightarrow 2H^+(aq) + 2e^-$
C.	$H_2(g) \rightarrow 2H^+(aq) + 2e^-$	$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$
D.	$O_2(g) + 2H_2O\ (l) + 4e^- \rightarrow 4OH^-(aq)$	$H_2(g) + 2OH^-(aq) \rightarrow 2H_2O(l) + 2e^-$

Question 6

Fuel cells are not widely used as commercial energy sources due to numerous disadvantages. Which of these is not a reason for their limited use?

A. Issues with fuel storage and safety during transportation.
B. Very low energy efficiency during conversion of chemical to electrical energy.
C. High costs associated with maintenance and operation of a fuel cell.
D. Continuous supply of reactants required to power a fuel cell.

The following information refer to question 7 and 8

9.00 g of carbon is combusted using the apparatus shown below. The temperature of 100 mL of water rose to 32.8° C from 20.0° C.

(Image modified from VCAA Chemistry Exam, 2019)

Question 7

The amount of heat causing the temperature of water to increase is

A. 4.82 kJ
B. 137 kJ
C. 5.35 kJ
D. 5.33 kJ

Question 8

The heat of combustion for the sample of carbon is closest to

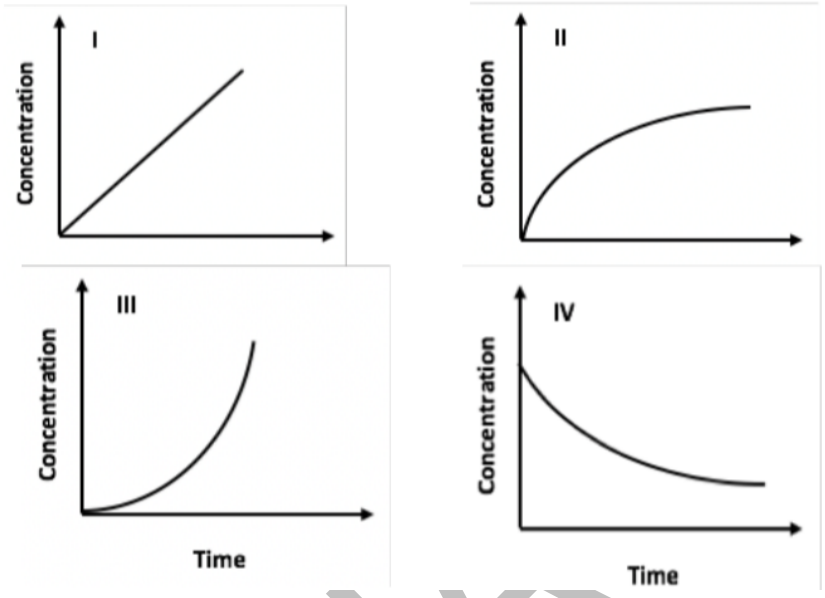
A. 7.11 J mol^{-1}
B. 5.33 kJ mol^{-1}
C. 7.11 kJ mol^{-1}
D. 963 J mol^{-1}

Question 9

Phosphorus (V) chloride gas, PCl_5, decomposes to form phosphorus (III) chloride gas, PCl_3, and chlorine gas, Cl_2, according to the following equation:

$$PCl_5\,(g) \rightleftharpoons PCl_3\,(g) + Cl_2\,(g)$$

Which of the following graphs show the change in concentration of PCl_5 and Cl_2, respectively as the decomposition progresses?



A. I and IV
B. III and IV
C. IV and III
D. IV and II

Question 10

Propanone (C_3H_6O) can be made from 2-propanol using a copper-zinc catalyst at a particular temperature.

$C_3H_8O\,(g) \rightleftharpoons C_3H_6O\,(g) + H_2\,(g)\;\Delta H = -54\;kJ\;mol^{-1}$

At equilibrium, 10% of the 2-propanol is converted to propanone. Which of the following would increase the rate of production and percentage yield of propanone at equilibrium?

A. Lower the temperature and lower the pressure
B. Lower the temperature and raise the pressure
C. Raise the temperature and lower the pressure
D. Raise the temperature and raise the pressure

Question 11

Magnesium chloride can be generated by reacting 6.0 g of magnesium oxide powder with 1 M hydrochloric acid. Which of the following is least likely to lead to an increase in the rate of formation of magnesium chloride?

A. Raising the atmospheric pressure
B. Grinding the magnesium oxide to a fine powder
C. Raising the temperature
D. Raising the concentration of hydrochloric acid

Question 12

A current is applied to two electrolytic cells. In the first cell, silver is deposited on an electrode while in the second cell, a zinc electrode is consumed. Assuming that same amount of current flows through both cells, if 1.2 g of zinc dissolves in cell 2, the amount of silver plated in cell 1 is closest to:

A. 2.0g
B. 0.6g
C. 4.0g
D. 4.1g