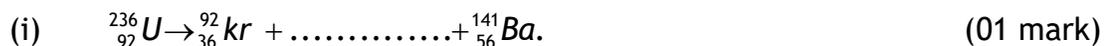


Molar gas constant, $R = 8.31 \text{ JK}^{-1}\text{mol}^{-1}$.
Molar volume of gas at s.t.p is 22.4 litres.
Standard pressure = 760mmHg or 101325Nm^{-2} .

For Examiners use only.

1	2	3	4	5	6	7	8	9	10	11	TOTAL

1. (a) Complete the following equations.



(b) The half-life of bismuth is 20 minutes. Determine the time taken for bismuth to decay to 75%. (03 marks)

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2. (a) State Graham's law (02 marks)

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(b) A certain volume of oxygen diffused through a porous membrane in 120s. Under the same volume of a gas, X diffuses in 112s. Calculate the relative molecular mass of X. (04 marks)

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3. When a gaseous hydrocarbon Z, was burnt in air 17.6g of carbondioxide and 7.2g of water were given off. The vapour density of Z is 28.

(a) Calculate;

(i) the empirical formula of Z. (3 marks)

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(ii) the molecular formula of Z. (1 mark)

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(b) Write chemical formula for three possible structural isomers of Z. (3 marks)

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4. (a) The diagram in figure 1 shows isotherms of a gas.

(i) What is critical temperature of the gas (1 mark)

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(ii) Which isotherm almost represents the behaviour of an ideal gas? (1 mark)

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(iii) What does the region ABC represent? (1 mark)

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(b) State one condition necessary for liquefying a gas. (1 mark)

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5. (a) Name a reagent that can be used to distinguish between the following pairs of ions. In each case, state what is observed if each ion is separately treated with the reagent.

(i) Ba^{2+} and Ca^{2+}
Reagent

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Observation

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(03 marks)

(ii) NO_2^- and NO_3^-
Reagent

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Observation

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(03 marks)

6. The mass spectrum of chlorine shows peaks at masses 70, 72 and 74. The heights of the peaks respectively are in the ration of 9:6:1

Calculate;

(a) the average atomic mass of chlorine.

(02 marks)

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(b) the relative abundance of ^{35}Cl and ^{37}Cl .

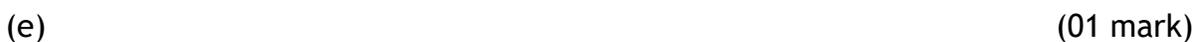
(02 marks)

7. Give the IUPAC name of each of the following;

(a) $CH_3CHCH_2C \equiv CH$

(01 mark)

Br



8. The diagram below shows part of the atomic emission spectrum of hydrogen.

(a) State;

(i) the information that can be obtained from the separate lines about the electronic structure of the hydrogen atom.

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(ii) how an emission line arises (2 ½ marks)

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(b) Briefly explain why the emission lines get closer together. (3 ½ marks)

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(c) State what is meant by the term principal quantum number. (1 ½ marks)

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9. Write a structural formula of each of the following organic compounds;

(a) Butan - 2 - ol. (01 mark)

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(b) But - 1 - yne. (1 mark)

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(c) 2, 2 - Dibromopropan - 1 - ol (01 mark)

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(d) 1, 2 - Dichloropropane. (01 mark)

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(e) Cyclohexanol (01 mark)

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10. 6.3g of ethanedioic acid crystals of formula $\text{H}_2\text{C}_2\text{O}_4 \cdot n\text{H}_2\text{O}$ was dissolved in 120cm^3 of 2M sodium hydroxide solution. The resultant solution was made up to 200cm^3 with water. 25cm^3 of this solution required 35cm^3 of 0.5M hydrochloric acid to completely neutralize the excess sodium hydroxide. Calculate;

(a) the number of moles of sodium hydroxide that reacted with hydrochloric acid.

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(b) the total number of moles of excess sodium hydroxide.

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- (ii) Determine the molecular mass of its fluoride if 0.1g of the fluoride when vapourised at 20°C and 766mmHg had a volume of 22.10cm³. (1 mole of a gas occupies 22.4 litres at s.t.p) (3 marks)

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END