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| **Chemistry B (Salters)**Y12 Open-Book AssessmentAS ChemistryChristopher Shortman | **/C:/assets/img/ocr_design/cover_logo_new.png** |
| Please note that you may see slight differences between this paper and the original.Candidates answer on the Question paper.**OCR supplied materials:**Additional resources may be supplied with this paper.**Other materials required:**•   Pencil•   Ruler (cm/mm)  | **Duration:** 2 hours       |
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## INSTRUCTIONS TO CANDIDATES

•   Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
•   Use black ink. HB pencil may be used for graphs and diagrams only.
•   Answer **all** the questions, unless your teacher tells you otherwise.
•   Read each question carefully. Make sure you know what you have to do before starting your answer.
•   Where space is provided below the question, please write your answer there.
•   You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number
    and question number(s).

## INFORMATION FOR CANDIDATES

•   The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography
    a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and
    grammar and the use of specialist terminology* is assessed.
•   The number of marks is given in brackets **[ ]** at the end of each question or part question.
•   The total number of marks for this paper is **100**.
•   The total number of marks may take into account some 'either/or' question choices.

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| **1.** | How many protons are in a hydroxide ion, OH−?1. 1
2. 8
3. 9
4. 10

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **2.** | Which of the following is the correct electronic configuration for a potassium ion, K+?1. 1s22s22p63s1
2. 1s22s22p63s23p6
3. 1s22s22p63s23p64s1
4. 1s22s22p63s23p64s2

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **3.** | Which pair would give a bright yellow precipitate when mixed?1. hydrochloric acid and copper(II) sulfate solution
2. sodium hydroxide solution and iron(III) sulfate solution
3. sodium iodide solution and lead(II) nitrate solution
4. sodium sulfate solution and barium nitrate solution

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **4.** | Ammonia is made by the reaction shown below.N2 + 3H2 ⇌ 2NH3 Δ*H* = −92 kJ mol−1Which conditions will result in the greatest equilibrium yield of ammonia?

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|  | **Temperature** | **Pressure** |
| **A** | high | high |
| **B** | low | high |
| **C** | high | low |
| **D** | low | low |

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **5.** | Why do the boiling points of the halogens increase down the group?1. There is an increase in bond enthalpy.
2. There is an increase in bond polarity.
3. There is an increase in the strength of instantaneous dipoles.
4. There is a decrease in electronegativity.

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **6.** | The depletion of ozone is catalysed by chlorine radicals.Which of the following describes a termination step of the radical mechanism?

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|  | **Number of radicals** | **Enthalpy change** |
| **A** | decreases | negative |
| **B** | increases | negative |
| **C** | decreases | positive |
| **D** | increases | positive |

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **7.** | What is the effect on the volume when the pressure of an ideal gas is doubled at the same time as the temperature (in Kelvin) is doubled?1. halved
2. remains the same
3. doubled
4. quadrupled

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **8.** | Concentrated sulfuric acid is warmed with sodium bromide.Which products are formed?1. HBr as the only gas
2. no products
3. H2S, Br2 and HBr
4. SO2, Br2 and HBr

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **9.** | Which reaction will **not** give bromoethane as a product?1. Ethane with bromine in ultraviolet radiation.
2. Ethene with bromine at room temperature and pressure.
3. Ethene with hydrogen bromide at room temperature and pressure.
4. Ethanol with sodium bromide and concentrated sulfuric acid, heated under reflux.

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **10.** | Tin reacts with concentrated nitric acid, as shown in the equation below.Sn + 4HNO3 → 4NO2 + SnO2 + 2H2OWhich row represents the oxidation state changes for nitrogen and tin in this reaction?

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|  | **Nitrogen** | **Tin** |
| **A** | increases by 1 | decreases by 2 |
| **B** | increases by 1 | decreases by 4 |
| **C** | decreases by 1 | increases by 2 |
| **D** | decreases by 1 | increases by 4 |

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **11.** | Which bar chart shows the boiling points of the group 15 hydrides?/C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p5_01a_150.pngYour answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **12.** | A substance has the formula shown below.CH2 = CC*ι*CH2CH3Which of the following is a structural **isomer** of this substance?1. 2-chlorobut-1-ene
2. 3-chlorobut-4-ene
3. 2-chloromethylpropene
4. 1-chloromethylpropene

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **13.** | Which molecule is linear in shape?1. SO2
2. H2S
3. CS2
4. C*ι*2O

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **14.** | The following data were collected for the equilibrium H2(g) + I2(g) ⇌ 2HI(g) at 500 K./C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p6_01a_150.pngWhat will be the value of [HI(g)]eqm under these conditions?1. 5.9 × 10−3
2. 0.45
3. 0.90
4. 0.95

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **15.** | Which molecule is non-polar?1. IBr
2. CH2C*ι*2
3. NF3
4. BF3

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **16.** | Propan-1-ol is heated with AZ2O3. The organic product is then reacted with bromine.What is the final outcome of these two reactions?1. 1-bromopropane
2. 1-bromopropane and 2-bromopropane
3. 1,2-dibromopropane
4. 1,3-dibromopropane

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **17.** | Which pair of compounds will react to form the ester CH3CH2COOCH2CH2CH2CH3?1. CH3CH2CH2OH and CH3CH2CH2COOH
2. CH3CH2CH2OH and (CH3CO)2O
3. CH3CH2COOH and CH3CH2CH2CHO
4. (CH3CH2CO)2O and CH3CH2CH2CH2OH

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **18.** | Some students wish to make 0.970 mol of zinc oxide by the reaction shown below. They are told that the reaction gives a 95.0% yield.ZnCO3(s) → ZnO(s) + CO2(s)What mass of zinc carbonate should they heat?1. 83.2 g
2. 117 g
3. 122 g
4. 128 g

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **19.** | Which solution contains the greatest number of ions?1. 10.0 cm3 of 0.500 mol dm−3 NaC*ι*
2. 0.300 dm3 of 0.0400 mol dm−3 NaC*ι*
3. 0.0200 dm3 of 0.500 mol dm−3 MgC*ι*2
4. 40.0 cm3 of 0.150 mol dm−3 MgC*ι*2

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **20.** | Nitrogen and oxygen combine, as shown below.N2(g) + O2(g) ⇌ 2NO(g) Δr*H* = +180 kJ mol−1Which statement is correct for this reaction?1. The reaction is exothermic.
2. The activation enthalpy for the reverse reaction is smaller than the activation enthalpy for the forward reaction.
3. Once energy equal to the activation enthalpy has been provided, the reaction will continue without further energy input.
4. The sum of the bond enthalpies of bonds made is greater than the sum of the bond enthalpies of bonds broken.

Your answer  /C:/core/files/questions/1499420836/H033ChemistryBH033-012016Jun/img/p2_01a_150.png**[1]**  |

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| **21.** | How many hydrogen atoms are there in 1 mol of methanol?

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| **A** | 3 |
| **B** | 4 |
| **C** | 1.8 × 1024 |
| **D** | 2.4 × 1024 |

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| **22.** | Which row could be correct for **solids** with the structure type named?

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|   | **Structure type** | **Melting point** | **Solubility in water** | **Electrical conductivity** |
| **A** | ionic | high | soluble | high |
| **B** | metallic | high | insoluble | high |
| **C** | ionic | low | soluble | high |
| **D** | metallic | low | insoluble | low |

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| **23.** | What is a correct measure of percentage atom economy?

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| **A** | mass of useful products × 100 / mass of reactants |
| **B** | amount of products × 100 / amount of reactants |
| **C** | Mr of products × 100 / Mr of reactants |
| **D** | Mr of useful products × 100 / Mr of reactants |

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| **24.** | What is correct about hydrogen bromide?

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| **A** | It reacts with concentrated sulfuric acid to form Br2 and H2S. |
| **B** | It forms white fumes with ammonia. |
| **C** | Its Mr is 79.9. |
| **D** | It does **not** decompose on heating. |

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| **25.** | For which purpose is distillation used?

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| **A** | to allow a liquid to boil without the loss of vapour |
| **B** | to purify a liquid product |
| **C** | to remove an involatile impurity |
| **D** | to allow further reaction without the loss of product |

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| **26.** | What is correct about a ‘green chemistry’ process?

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| **A** | It makes waste products that are easier to separate. |
| **B** | It makes processes cheaper. |
| **C** | It uses organic solvents. |
| **D** | It reduces the number of steps necessary. |

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| **27.** | A sample of gas, volume V, has its temperature raised from 0°C to 20°C. The pressure remains constant.What is the new volume?

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| **A** | 0.005 V |
| **B** | 0.93 V |
| **C** | 1.07 V |
| **D** | 20 V |

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| **28.** | Which row is correct for the silver halide shown?

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|   | **Halide** | **Colour** | **Solubility in ammonia** |
| **A** | silver chloride | white | soluble |
| **B** | silver bromide | yellow | insoluble |
| **C** | silver iodide | yellow | soluble |
| **D** | silver iodide | cream | partially soluble |

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| **29.** | CH3Cl can be converted to CH3NH2 in one step.What is correct about this process?

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| **A** | The reaction is substitution of Cl by NH3. |
| **B** | The product is an amide. |
| **C** | The reagent is NH4+. |
| **D** | The reagent is a nucleophile. |

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| **30.** | CH3Cl and CH3I both react with hydroxide ions.What is correct about these reactions?

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| **A** | CH3Cl reacts faster because the C–Cl bond is more polar than the C–I bond. |
| **B** | CH3I reacts faster because the C–Cl bond is stronger than the C–I bond. |
| **C** | Both form ethanol. |
| **D** | In each case, homolytic bond fission occurs. |

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| Your answer | /C:/core/files/questions/1528465607/H033H433-ChemistryB-H033-01-Jun17/img/square_150.png | **[1]** |

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| **31.** | What will react with a phenol?

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| **A** | sodium carbonate |
| **B** | sodium hydroxide |
| **C** | ethanoic acid |
| **D** | acidified potassium dichromate |

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| Your answer | /C:/core/files/questions/1528465607/H033H433-ChemistryB-H033-01-Jun17/img/square_150.png | **[1]** |

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| **32.** | When are insoluble impurities removed during recrystallisation?

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| **A** | when the hot solution is filtered |
| **B** | as the solution cools |
| **C** | when the crystals are filtered off |
| **D** | when the crystals are washed |

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| Your answer | /C:/core/files/questions/1528465607/H033H433-ChemistryB-H033-01-Jun17/img/square_150.png | **[1]** |

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| **33.** | Which of these is classified as an elimination reaction?

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| **A** | CH3COOH + C2H5OH → CH3COOC2H5 + H2O |
| **B** | CuSO4•5H2O → CuSO4 + 5H2O |
| **C** | C2H5OH → C2H4 + H2O |
| **D** | C17H36 → C10H22 + C7H14 |

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| **34.** | CuCO3 → CuO + CO20.618 g of copper carbonate (Mr = 123.5) is heated.What is the volume of CO2 produced at room temperature and pressure?

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| **A** | 120 cm3 |
| **B** | 1.2 dm3 |
| **C** | 240 cm3 |
| **D** | 12 dm3 |

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| **35.** | What is correct about a sodium chloride lattice?

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| **A** | There are attractions between ions of different charge. |
| **B** | The sodium ions are larger than the chloride ions. |
| **C** | The numbers of sodium ions and chloride ions are not equal. |
| **D** | Each sodium ion is surrounded by four chloride ions. |

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| **36.** | What is correct about an exothermic reaction?

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| **A** | Heat is taken in. |
| **B** | More bonds are made than broken. |
| **C** | The sign of ΔH is positive. |
| **D** | It is represented by a downwards arrow on an enthalpy profile diagram. |

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| **37.** | What is the functional group in the compound CH3COOCOC2H5?

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| **A** | carboxylic acid |
| **B** | ester |
| **C** | acid anhydride |
| **D** | ketone |

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| **38.** | This question concerns four compounds each with four carbon atoms.

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| 1. CH3CH2CH2CH2OH | 2. CH3CH(CH3)CH2OH |
| 3. CH3CH2CH2CHO | 4. CH3CH2OCH2CH3 |

What is the order of their boiling points, largest first?

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| **A** | 1 2 3 4 |
| **B** | 1 2 4 3 |
| **C** | 4 3 1 2 |
| **D** | 3 4 2 1 |

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| **39.** | Which has the largest bond angle?

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| **A** | BF3 |
| **B** | CF4 |
| **C** | NF3 |
| **D** | OF2 |

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| **40.** | Nitrogen monoxide, NO, reacts instantaneously in air to form NO2.What is an explanation for this?

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| **A** | NO is a radical taking part in a termination reaction. |
| **B** | the activation enthalpy for the reaction is low. |
| **C** | oxygen is a very reactive gas. |
| **D** | NO2 is less stable than NO. |

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| **41.** | What is the correct order of radiation in order of increasing wavelength?

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| **A** | ultraviolet < visible < infrared |
| **B** | ultraviolet < infrared < visible |
| **C** | visible < infrared < ultraviolet |
| **D** | infrared < visible < ultraviolet |

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| **42.** | Which of the following is a cyclic saturated aliphatic compound?

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| **A** | cyclohexene |
| **B** | cyclohexane |
| **C** | benzene |
| **D** | hexane |

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| **43.** | What is **not** a property of hydrogen iodide?

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| **A** | It reacts with ammonia. |
| **B** | It is soluble in water. |
| **C** | It is stable to heat. |
| **D** | It reacts with sodium hydroxide. |

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| **44.** | What is the correct order of boiling points with the lowest first?

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| **A** |

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| CH4 | CH3Cl | CH3OH |  |

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| **B** |

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| --- | --- | --- | --- |
| CH4 | CH3OH | CH3Cl |  |

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| **C** |

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| --- | --- | --- | --- |
| CH3Cl | CH3OH | CH4 |  |

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| **D** |

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| CH3OH | CH3Cl | CH4 |  |

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| **45.** | Which statement about ozone is correct?

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| **A** | Ozone is a polluting gas in the stratosphere. |
| **B** | Ozone acts as a sunscreen in the stratosphere. |
| **C** | There is no ozone in the troposphere. |
| **D** | Ozone is an isomer of oxygen. |

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| **46.** | A company makes a cleaning product and is looking for a ‘greener’ method of making the product.Which one of the following would the company consider?

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| **A** | Finding a reaction with a higher percentage yield. |
| **B** | Finding a reaction with a higher atom economy. |
| **C** | Using more organic solvents. |
| **D** | Using inorganic catalysts rather than enzymes. |

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| Your answer | /C:/core/files/questions/1553315538/H033H433-ChemB-H033-01-Jun18/img/square_150.png | **[1]** |

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| **47.** | Name the functional group in HCHO.

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| **A** | aldehyde |
| **B** | ketone |
| **C** | alcohol |
| **D** | carboxylic acid |

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| Your answer |  | **[1]** |

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| **48.** | 1.0 g of solid carbon dioxide is vaporised.What volume of gas (in cm3) is produced at RTP?

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| **A** | 0.55 |
| **B** | 24 |
| **C** | 550 |
| **D** | 24 000 |

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| Your answer |  | **[1]** |

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| **49.** | What is the percentage of chlorine by mass in magnesium chloride?

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| **A** | 59% |
| **B** | 66% |
| **C** | 74% |
| **D** | 75% |

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| Your answer |  | **[1]** |

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| **50.** | Which statement about the reactions of solid halides with concentrated sulfuric acid is correct?

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| **A** | Chlorides produce HCl as the only gas. |
| **B** | Bromides produce HBr, Br2 and H2S. |
| **C** | Iodides produce HI, I2 and SO2. |
| **D** | Astatides would be expected to produce HAt only. |

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| **51.** | Which statement about electronegativity is correct?

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| **A** | Electronegativity is the charge on an element’s ion. |
| **B** | If a bond is polar, the two atoms have different electronegativities. |
| **C** | If a molecule has no dipole, all its atoms have the same electronegativity. |
| **D** | Electronegativity increases down a group of the Periodic Table. |

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| Your answer |  | **[1]** |

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| **52.** | Which substance does **not** have hydrogen bonding between its molecules?

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| **A** | C6H5OH |
| **B** | CH3CHO |
| **C** | CH3COOH |
| **D** | C3H7OH |

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| Your answer |  | **[1]** |

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| **53.** | Which statement about the flame colour of lithium is correct?

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| **A** | It is yellow. |
| **B** | It is caused by electrons absorbing visible light. |
| **C** | It is the result of bright lines in lithium’s emission spectrum. |
| **D** | It follows a pattern of colours in Group 1. |

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| Your answer |  | **[1]** |

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| **54.** | 35 cm3 of a solution has a concentration of 0.125 mol dm−3.A student calculates the amount (in moles) of solute in this solution.Which answer is given to the appropriate number of significant figures?

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| **A** | 4.37 × 10−3 |
| **B** | 4.375 × 10−3 |
| **C** | 4.38 × 10−3 |
| **D** | 4.4 × 10−3 |

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| Your answer |  | **[1]** |

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| **55.** | Hydrochloric acid reacts with sodium carbonate as shown in the equation.2HCl + Na2CO3 → 2NaCl + CO2 + H2O20 cm3 of 2.0 mol dm−3 Na2CO3 are added to 20 cm3 2.0 mol dm−3 HCl.What mass of CO2 (in g) is produced?

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| **A** | 0.88 |
| **B** | 1.76 |
| **C** | 22 |
| **D** | 1760 |

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| **56.** | A sample of gas has a mass of m g and occupies a volume V m3 at a pressure p Pa and temperature T K.Which expression is correct for the Mr of the gas?

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| **A** | mRT / pV |
| **B** | pV / mRT |
| **C** | pV / RT |
| **D** | mRT / npV |

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| Your answer |  | **[1]** |

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| **57.** | Which statement about carboxylic acids is correct?

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| **A** | They can be made by oxidising secondary alcohols. |
| **B** | They react with phenols. |
| **C** | They do **not** fizz with sodium carbonate solution. |
| **D** | They form esters when reacted with tertiary alcohols. |

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| Your answer |  | **[1]** |

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| **58.** | What is **not** a consequence of hydrogen bonding?

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| **A** | Water expands on freezing. |
| **B** | Ethanol is very soluble in water. |
| **C** | Sodium chloride dissolves in water. |
| **D** | H2O has a higher boiling point than H2S. |

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| Your answer |  | **[1]** |

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| **59.** | Which statement about a lattice of sodium chloride is correct?

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| **A** | The ions are the same size. |
| **B** | The attraction between two sodium ions is greater than the repulsion between two chloride ions. |
| **C** | Each sodium ion is surrounded by six chloride ions. |
| **D** | There are more sodium ions than chloride ions. |

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| Your answer |  | **[1]** |

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| **60.** | Which row is correct?

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|   |  **Name** |  **Formula** |   |
|  **A** |  sodium nitride |  Na3N |   |
|  **B** |  aluminium sulfate |  AlSO4 |   |
|  **C** |  copper(I) oxide |  CuO |   |
|  **D** |  calcium hydroxide |  CaOH2 |   |

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| Your answer |  | **[1]** |

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| **61.** | What is the outer subshell electron configuration of an element in Group 16 of the Periodic Table?

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| **A** | p4 |
| **B** | p5 |
| **C** | p6 |
| **D** | p16 |

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| Your answer |  | **[1]** |

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| **62.** | Geiger and Marsden fired α-particles at a gold foil. What happened in their experiment?

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| **A** | The α-particles were scattered randomly. |
| **B** | Most α-particles passed through undeflected. |
| **C** | Many α-particles bounced back. |
| **D** | No α-particles were deflected. |

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| Your answer |  | **[1]** |

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| **63.** | Which molecule has no lone pairs?

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| **A** | BeCl2 |
| **B** | CF4 |
| **C** | NH3 |
| **D** | BH3 |

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| Your answer |  | **[1]** |

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| **64.** | What is the volume (in cm3) of 4.4 g of CO2 at RTP?

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| **A** | 105.6 |
| **B** | 2.4 × 103 |
| **C** | 2.4 × 104 |
| **D** | 105 600 |

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| Your answer |  | **[1]** |

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| **65.** | Which reaction will give CH3CH2CH(OH)CH2CH3 as a product?

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| **A** | Reduction of CH3CH2CH2CH2CHO |
| **B** | Treatment of CH2=CHCH2CH2CH3 with conc sulfuric acid followed by water |
| **C** | Heating CH3CH2CH2CH=CH2 with steam and phosphoric acid under pressure |
| **D** | Treatment of CH3CH=CHCH2CH3 with conc sulfuric acid followed by water |

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| Your answer |  | **[1]** |

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| **66.** | Which statement about the reaction RCl + NH3 → RNH2 + HCl is correct?

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| **A** | An amine is formed. |
| **B** | RCl is acting as an acid. |
| **C** | The reaction is electrophilic substitution. |
| **D** | An amide is formed. |

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| Your answer |  | **[1]** |

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| **67.** | The mass spectrum of ethanoic acid has a peak at m/z 45. Which species could cause this?

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| **A** | CH3COOH+ |
| **B** | COOH+ |
| **C** | 13CH3COOH+ |
| **D** | CH3+ |

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| Your answer |  | **[1]** |

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| **68.** | What is formed at the cathode when aqueous aluminium sulfate is electrolysed?

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| **A** | Hydrogen |
| **B** | Oxygen |
| **C** | Aluminium |
| **D** | Sulfur dioxide |

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| Your answer |  | **[1]** |

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| **69.** | Which term correctly describes cyclohexane?

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| **A** | Arene |
| **B** | Alkene |
| **C** | Aliphatic |
| **D** | Unsaturated |

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| Your answer |  | **[1]** |

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| **70.** | Urea has formula CO(NH2)2.What is the percentage of nitrogen by mass in urea?

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| **A** | 23% |
| **B** | 25% |
| **C** | 41% |
| **D** | 47% |

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| **71.** | What is a property of solid iodine?

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| **A** | It is very soluble in water. |
| **B** | It is purple in colour. |
| **C** | It dissolves in organic solvents. |
| **D** | It melts when heated at room pressure. |

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| Your answer |  | **[1]** |

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| **72.** | Silver nitrate solution is added to solutions of sodium halides.Which row is correct?

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|  | **Halide** | **Precipitate formed with silver nitrate** |
| **A** | chloride | white, insoluble in ammonia |
| **B** | iodide | cream, insoluble in ammonia |
| **C** | chloride | cream, soluble in ammonia |
| **D** | iodide | yellow, insoluble in ammonia |

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| Your answer |  | **[1]** |

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| **73.** | What is the action (if any) of concentrated sulfuric acid on HBr?

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| **A** | No reaction |
| **B** | Forms SO2 |
| **C** | Forms H2S |
| **D** | Forms sulfur |

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| Your answer |  | **[1]** |

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| **74.** | Which molecule forms permanent dipole – permanent dipole bonds as its strongest intermolecular bond?

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| **A** | CH3CHO |
| **B** | CH3COOH |
| **C** | CCl4 |
| **D** | CO2 |

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| Your answer |  | **[1]** |

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| **75.** | A student says that bio-ethanol is carbon neutral.Which option provides evidence that disagrees with the student’s statement about bio-ethanol?

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| **A** | It gives off carbon dioxide when it burns. |
| **B** | It is made from crops that absorb carbon dioxide. |
| **C** | Energy from conventional power-stations is used to make it. |
| **D** | Valuable land is used up growing the crops used to make bio-ethanol. |

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| Your answer |  | **[1]** |

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| **76.** | Which substance **cannot** be made in a single step from C2H4?

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| **A** | C2H5OH |
| **B** | C2H5Br |
| **C** | C2H6 |
| **D** | C2H5NH2 |

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| Your answer |  | **[1]** |

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| **77.** | Which substance will **not** give 3-methylpentane when reduced with hydrogen?

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| **A** | 2-ethylbut-1-ene |
| **B** | 3-methylpent-2-ene |
| **C** | 2-methylpent-1-ene |
| **D** | 3-methylpent-1-ene |

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| Your answer |  | **[1]** |

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| **78.** | What is **not** a reaction of 2-methylpropan-2-ol?

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| **A** | Reaction with an acid anhydride to form an ester |
| **B** | Oxidation to a ketone |
| **C** | Dehydration to an alkene |
| **D** | Reaction with HCl to form a haloalkane |

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| Your answer |  | **[1]** |

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| **79.** | Which statement about instantaneous dipole – induced dipole bonds is correct?

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| **A** | They become weaker with increasing chain length of an organic compound. |
| **B** | They become stronger with increased branching in organic compounds. |
| **C** | They occur between molecules rather than atoms in molecules. |
| **D** | In any molecule they are always the weakest intermolecular bond. |

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| Your answer |  | **[1]** |

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| **80.** | Which of the following is a redox reaction?

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| **A** | 2Na + 2H2O → 2NaOH + H2 |
| **B** | 2CrO42– + 2H+ → Cr2O72– + H2O |
| **C** | CaCO3 + 2HCl → CaCl2 + H2O |
| **D** | MgCO3 → MgO + CO2 |

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| Your answer |  | **[1]** |

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| **81.** | Which statement is correct about fusion reactions?

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| **A** | They occur at room temperature and pressure. |
| **B** | They result in the formation of new elements. |
| **C** | They only occur in stars. |
| **D** | They only occur when a large nucleus collides with a small nucleus. |

Your answer  **[1]**  |

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| **82.** | Which statement is correct about orbitals?

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| **A** | s-orbitals are circular. |
| **B** | Orbitals always contain two electrons |
| **C** | A*l* has an orbital containing a single electron. |
| **D** | A p-orbital can contain up to six electrons. |

Your answer  **[1]**  |

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| **83.** | Which statement is correct about the melting points and structures of the elements in Period 2?

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| **A** | The melting points increase across the Period. |
| **B** | Elements on the left have ionic structures. |
| **C** | Elements on the right have covalent structures. |
| **D** | Metals have the highest melting points. |

Your answer  **[1]**  |

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| **84.** | What is a reason that the first ionisation enthalpy increases across a Period?

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| **A** | Each electron is attracted to more protons. |
| **B** | The electrons are further from the nucleus. |
| **C** | The atoms get larger. |
| **D** | The charge density of the ions increases. |

Your answer  **[1]**  |

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| **85.** | Which compounds will react together under appropriate conditions?

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| **A** | phenols and acid anhydrides |
| **B** | carboxylic acids and phenol |
| **C** | alcohols and phenols |
| **D** | ethers and carboxylic acids |

Your answer  **[1]**  |

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| **86.** | Which compound does **not** exist?

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| **A** | Fe2SO4 |
| **B** | Ag2SO4 |
| **C** | PbSO4 |
| **D** | Fe2(SO4)3 |

Your answer  **[1]**  |

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| **87.** | One method of producing hydrogen is the thermal decomposition of steam in the presence of a catalyst.Which set of conditions will produce the highest yield of hydrogen?

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|  | **Temperature** | **Pressure** |
| **A** | High | High |
| **B** | High | Low |
| **C** | Low | Low |
| **D** | Low | High |

Your answer  **[1]**  |

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| **88.** | Tests are done on an aqueous solution containing two sodium salts.The results are shown below.

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| **Test** | **Result** |
| Add aqueous chlorine followed by an organic solvent | Brown aqueous layer and brown organic layer |
| Add aqueous barium nitrate | White precipitate |

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What are the anions in the solution?

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| **A** | bromide and sulfate |
| **B** | sulfate and iodide |
| **C** | sulfate and chloride |
| **D** | bromide and chloride |

Your answer  **[1]**  |

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| **89.** | What is a reason that BF3 has no overall dipole?

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| **A** | It is the same shape as ammonia. |
| **B** | B and F have very similar electronegativities. |
| **C** | It is trigonal. |
| **D** | It is a small molecule. |

Your answer  **[1]**  |

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| **90.** | What is correct about a solution of phenol?

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| **A** | It will give a red colour with neutral iron(III) chloride. |
| **B** | It will fizz with sodium carbonate. |
| **C** | It will get warm when sodium hydroxide is added. |
| **D** | It will react with a solution of ethanoic acid to form an ester. |

Your answer  **[1]**  |

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| **91.** | MnO4− ions react with Fe2+ ions according to the equation shown below.    MnO4− + 5Fe2+ + 8H+ → Mn2+ + 5Fe3+ + 4H2OWhat volume of 0.100 mol dm−3 potassium manganate(VII) is needed to react with 0.250 grams of iron dissolved in sulfuric acid?

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| **A** | 8.96 cm3 |
| **B** | 22.4 cm3 |
| **C** | 44.8 cm3 |
| **D** | 224 cm3 |

Your answer  **[1]**  |

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| **92.** | A chemist wants to accurately determine the aspirin content of an aspirin tablet.Which of the following techniques should the chemist use?1. thin layer chromatography
2. melting point determination
3. addition of a neutral solution of iron(III) chloride
4. titration with sodium hydroxide solution

Your answer  **[1]**  |

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| **93.** | What volume of 0.250 mol dm−3 sodium hydroxide solution should be diluted to 1000 cm3 to make a 0.0100 mol dm−3 solution?1. 40 cm3
2. 50 cm3
3. 80 cm3
4. 160 cm3

Your answer  **[1]**  |

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| **94.** | A student carries out a titration. Sodium hydroxide solution is transferred to a conical flask using a pipette. Methyl orange indicator is added to the flask. Hydrochloric acid is added from a burette until the indicator changes colour.Which of the following would lead to the titre being larger than it should be?1. Rinsing the conical flask with water before adding the sodium hydroxide solution.
2. Rinsing the burette with water before filling it with hydrochloric acid.
3. Rinsing the pipette with water before filling it with sodium hydroxide solution.
4. Adding extra drops of indicator.

Your answer  **[1]**  |

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| **95.** |   |

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|  | In a pilot plant making ammonia, NH3, 200 cm3 of nitrogen are mixed with 300 cm3 of hydrogen. What would be the final volume (at the same temperature and pressure) if complete reaction occurs? 1. 200 cm3
2. 250 cm3
3. 300 cm3
4. 400 cm3

Your answer  **[1]**  |

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| **96.** | Alcoholic drinks are solutions of ethanol in water. Ethanol is soluble in water due to hydrogen bonding.Which diagram best illustrates hydrogen bonding between a molecule of ethanol and a molecule of water?1.

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Your answer  **[1]**  |

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| **97.** | Four solutions, **W**, **X**, **Y**, **Z**, are known to contain ethanol, phenol, ethanoic acid and sodium carbonate. It is not known which solution is which.When solution **X** is mixed with solution **Z**, bubbles of gas are seen.Drops of universal indicator solution are added to separate samples of each solution. The results of this test are shown below.

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|   | **Solution W** | **Solution X** | **Solution Y** | **Solution Z** |
| Universal indicator solution | red solution | blue solution | green solution | red solution |

Which solution contains phenol?1. Solution **W**
2. Solution **X**
3. Solution **Y**
4. Solution **Z**

Your answer  **[1]**  |

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| **98.** | A chemist has four solutions, labelled **A**, **B**, **C** and **D**. Each contain one of salicylic acid (HOC6H4COOH), ethanoic acid, phenol, ethanol or aspirin (HOOCC6H4OCOCH3).It is not known which solution is which.Neutral iron(III) chloride solution and sodium carbonate solution are added separately to samples of **A**, **B**, **C** and **D**. The results of the tests are shown below.

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| --- | --- | --- | --- | --- |
|   | **Solution A** | **Solution B** | **Solution C** | **Solution D** |
| **Neutral iron(III) chloride solution** | purple colour | yellow colour | purple colour | yellow colour |
| **Sodium carbonate solution** | gas evolved | gas evolved | no change observed | no change observed |

Which solution contains salicylic acid?1. Solution **A**
2. Solution **B**
3. Solution **C**
4. Solution **D**

Your answer  **[1]**  |

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| **99.** | Exhaust gases from vehicle engines contain potential pollutants.Which substance(s) could be present in the exhaust gases from a vehicle engine as a result of the incomplete combustion of a hydrocarbon?**1:** Carbon monoxide**2:** Particulates**3:** Unburnt hydrocarbons1. 1, 2 and 3
2. Only 1 and 2
3. Only 2 and 3
4. Only 1Your answer

**[1]**  |

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| **100.** | Which of the following gases is / are produced when hydrogen burns in air at high temperature? **1:** Water vapour**2:** NOx**3:** Carbon dioxide1. 1, 2 and 3
2. Only 1 and 2
3. Only 2 and 3
4. Only 1

Your answer  **[1]**  |

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**END OF QUESTION PAPER**