



ST ANDREW'S SECONDARY SCHOOL

NAME

CLASS

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DATE

CHEMISTRY

6092



Mid-Year Examination 2021

Error Analysis

MARKS OBTAINED
25

 Record your answers here	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25					

- 1 Which statement about nitrogen atoms is **not** correct? [ACSB'17]
- A** All nitrogen atoms have the same atomic number.
- B** All nitrogen atoms have the same chemical properties.
- C** All nitrogen atoms have the same electronic configuration.
- D** All nitrogen atoms have the same mass number.
- 2 The table below shows the number of neutrons and electrons in four particles.

Particle	Number of neutrons	Number of electrons
P	18	8
Q⁺	12	10
R²⁻	16	10
S	22	18

Which particle is an isotope of **P**?

A Q

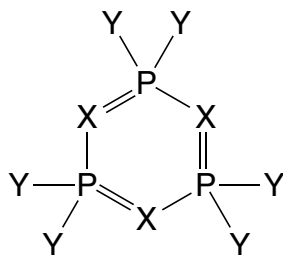
B R

C S

D None of the above

[ACSB'17]

- 3 A molecule consists of three types of atoms, P, X and Y.

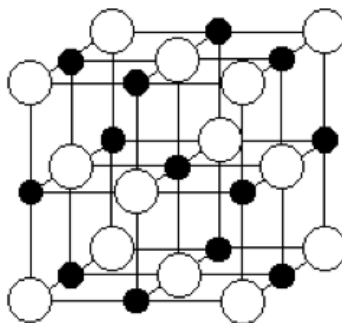


If P is phosphorous, what could X and Y be?

[ACSB'17]

	X	Y
A	Al	H
B	N	Cl
C	O	H
D	Si	Cl

- 4 The diagram shows part of the structure of a salt, XY.

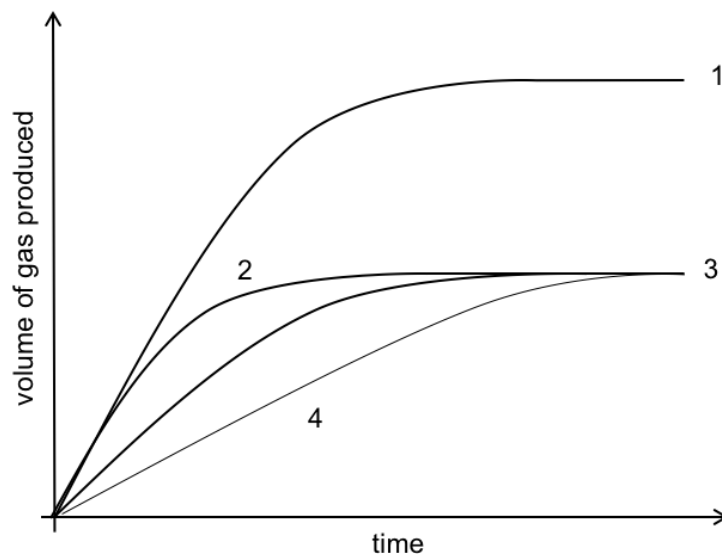


Which statement is correct?

[ACSB'17]

- A** Each Y⁻ ion is bonded to five X⁺ ions.
- B** Each X atom is bonded six Y atoms.
- C** The ratio of X⁺ to Y⁻ is 1:1.
- D** The structure shown is able to conduct electricity.

- 5 Sodium carbonate is added to separate solutions of excess 1.0mol/dm^3 ethanoic acid, hydrochloric acid and sulfuric acid.



Which correctly matches the graph to the acid used in each reaction?

[ACSB'17]

	Ethanoic acid	Hydrochloric acid	Sulfuric acid
A	4	2	1
B	3	4	1
C	4	3	2
D	3	4	2

- 6 Carbon disulfide, CS_2 is a simple covalent compound used in the manufacturing of polymers and fibres.

A student made the following statements:

- CS_2 has a low boiling point.
- CS_2 has good electrical conductivity when molten.
- CS_2 is very soluble in water.
- CS_2 is a crystalline solid at room temperature.

How many statement(s) is/are correct about CS_2 ?

[BBSS'17]

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

- 7 Bones contain a complex mixture of calcium salts, proteins and other materials. When a piece of bone is strongly heated in a current air, the only residue is calcium oxide. From a sample of 50.0g of bone, 14.0g of calcium oxide was obtained.

What is the percentage by mass of calcium in the bone?

[BBSS'17]

- A** 10.0% **B** 14.0% **C** 20.0% **D** 28.0%

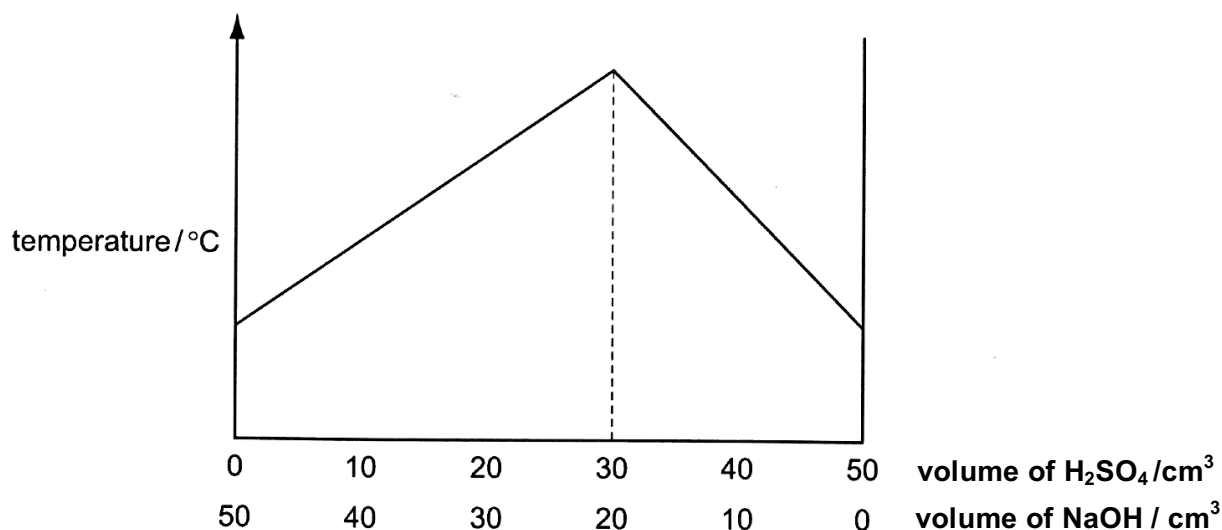
- 8 5.0cm^3 of gaseous hydrocarbon reacted with excess oxygen to form 30.0cm^3 carbon dioxide and 15.0cm^3 water vapour.

What is the formula of the hydrocarbon?

[BBSS'17]

- A** CH_4 **B** C_2H_4 **C** C_3H_6 **D** C_6H_6

- 9 An aqueous solution of sulfuric acid has a concentration of 1.0 mol/dm^3 . Different volumes of the acid are added to different volumes of aqueous sodium hydroxide.

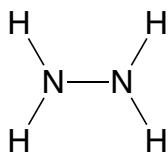


What is the concentration, in mol/dm^3 , of the aqueous sodium hydroxide?

[BBSS'17]

- A** 0.60 **B** 0.75 **C** 1.50 **D** 3.00

- 10 The diagram below shows the structural formula of a molecule of hydrazine, N_2H_4 .



Which is true of the number of electrons in the molecule?

[BDMS'17]

	Total number of electrons involved in bonding	Total number of electrons not involved in bonding
A	5	4
B	5	8
C	10	4
D	10	8

- 11 What does a solution of hydrogen chloride in ethanol contain?

[BDMS'17]

- A** Ethanol molecules and hydrogen chloride molecules
B Ethanol molecules, hydrogen ions and chloride ions
C Ethanol ions and hydrogen chloride molecules
D Ethanol ions, hydrogen ions and chloride ions

- 12 Which sample contains the most number of atoms?

[BDMS'17]

- A** 0.5 mol of C_2H_6 **B** 1.0 mol of SO_3 **C** 1.5 mol of CO_2 **D** 3.0 mol of He

13 Which substances can be used to reduce atmospheric pollution caused by flue gases? [BDMS'17]

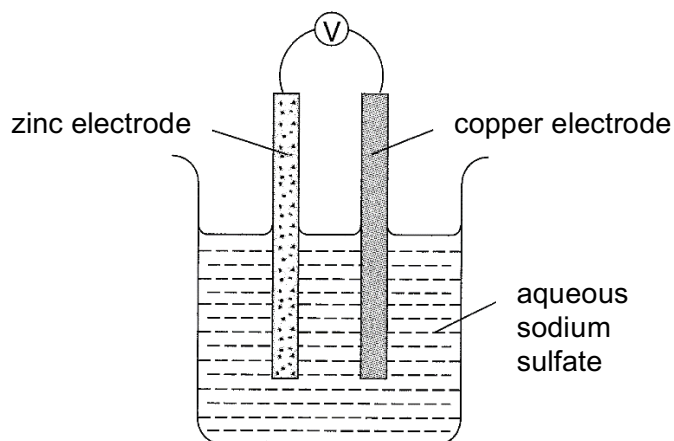
- A Ammonium carbonate and ammonium sulfate
- B Ammonium sulfate and calcium carbonate
- C Ammonium sulfate and calcium oxide
- D Calcium carbonate and calcium oxide

14 Which is the correct use of the different fractions in crude oil?

[BDMS'17]

	Fraction	Use
A	Bitumen	Lubricating machine parts
B	Kerosene	Fuel for aircraft
C	Naphtha	Pave roads
D	Petrol	Making chemicals

15 The diagram shows a simple cell.

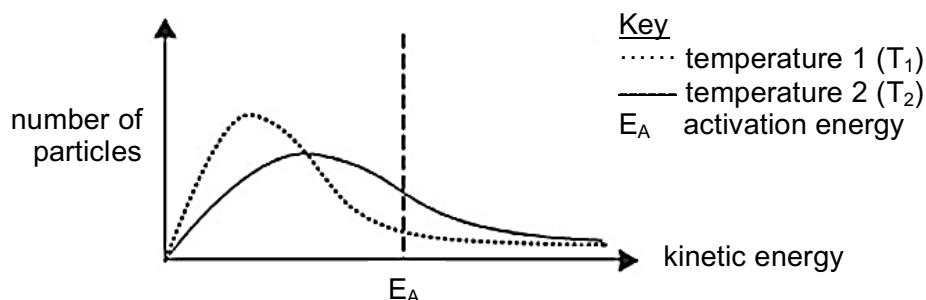


What happens when current flows through the circuit?

[IJKC'17]

- A Copper dissolves to form copper(II) ions.
- B Electrons flow from the copper electrode to the zinc electrode.
- C Hydrogen gas is liberated at the zinc electrode.
- D Zinc dissolves to form zinc ions.

- 16 The diagram represents the distribution of kinetic energy of reactant particles at two different temperatures.



Given that the areas under the two curves are equal, which statement about the reaction is correct?
 [IJKC'17]

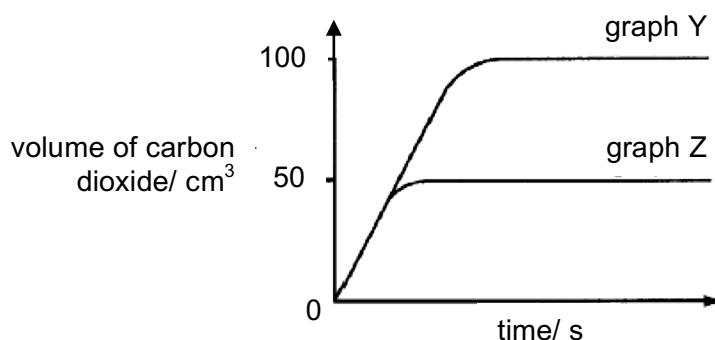
- A** At T_1 , the activation energy is lower than at T_2 .
B At T_1 , the enthalpy change of the reaction is higher than at T_2 .
C At T_2 , a greater number of particles have sufficient energy to react.
D At T_2 , the reaction takes a longer time to complete
- 17 Two substances, X and Y, react to produce substance Z. The enthalpy change for the reaction is -120kJ/mol , while the activation energy is $+200\text{kJ/mol}$.

What is the activation energy for the decomposition of substance Z to substances X and Y?

[IJKC'17]

- A** $+80\text{kJ/mol}$ **B** $+120\text{kJ/mol}$ **C** $+200\text{kJ/mol}$ **D** $+320\text{kJ/mol}$

- 18 Some sodium carbonate pellets were added to an excess of sulfuric acid at room temperature. The volume of carbonate dioxide produced was measured over a period of time. Graph Y shows the results obtained.

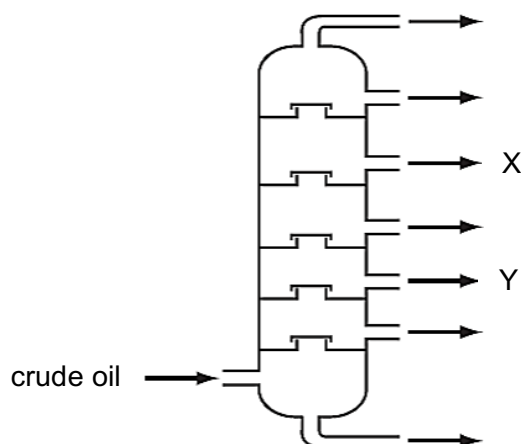


Which change could have produced graph Z?

[IJKC'17]

- A** Acid of half the original concentration was used.
B Half the mass of sodium carbonate pellets was used.
C Lower temperature was used instead.
D Powdered sodium carbonate of the same mass was used.

- 19 Crude oil can be separated into different fractions using fractional distillation. The positions at which fractions X and Y are collected are shown in the diagram.



Which statement about the fractional distillation of crude oil is correct?

[IJKC'17]

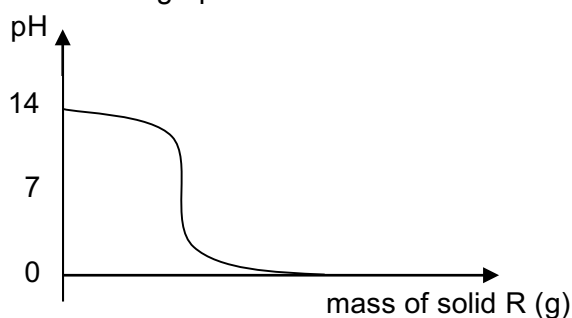
- A The temperature increases up the column.
- B X condenses at a lower temperature than Y.
- C X has a higher boiling point than Y.
- D X has longer chain molecules than at Y.

- 20 Which reaction does not involve either oxidation or reduction?

[IJTC'17]

- A $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- B $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$
- C $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$
- D $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$

- 21 Solid R is generally added to aqueous solution S. The changes in pH are shown on the graph below.



What are substances R and S?

[IJTC'17]

	R	S
A	Insoluble non-metal oxide	Sodium hydroxide
B	Soluble metal oxide	Aqueous ammonia
C	Soluble non-metal oxide	Aqueous ammonia
D	Soluble non-metal oxide	Sodium hydroxide

22 The following report appeared in a newspaper.

Drums of bromine broke open after a vehicle crash on the motorway. Traffic was diverted as purple gaseous bromine drifted over the road (it is denser than air), causing irritation to drivers' eyes. Firemen sprayed water over the scene of the accident, dissolving the bromine and washing it away.

What is wrong with the report?

[IJTC'17]

- A** Bromine does not dissolve in water.
- B** Bromine does not vaporise easily.
- C** Bromine is less dense than air.
- D** Bromine is not purple in colour.

23 Which oxide is unlikely to dissolve in aqueous sodium hydroxide?

[IJTC'17]

- A** Al_2O_3 **B** MgO **C** P_4O_{10} **D** SO_2

24 Which statement correctly describes the elements in Group 0 of the Periodic Table?

[IJTC'17]

- A** All of their atoms have eight electrons in their outer shell.
- B** They are colourful gases.
- C** They are inert and unreactive.
- D** They exist as diatomic molecules.

25 When dilute aqueous sodium chloride is electrolysed between platinum electrodes,

[IJTC'17]

- A** sodium is produced at the cathode.
- B** the mass of the anode decreases.
- C** the concentration of sodium chloride increases.
- D** the pH of the electrolyte decreases.

Group																	
I	II							VII	0								
		1 H hydrogen 1															
		Key proton (atomic) number atomic symbol name relative atomic mass															
3 Li lithium 7	4 Be beryllium 9																
11 Na sodium 23	12 Mg magnesium 24																
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium -	85 At astatine -	86 Rn radon -
87 Fr francium -	88 Ra radium -	89 – 103 actinoids	104 Rf Rutherfordium -	105 Db dubnium -	106 Sg seaborgium -	107 Bh bohrium -	108 Hs hassium -	109 Mt meitnerium -	110 Ds darmstadtium -	111 Rg roentgenium -	112 Cn copernicium -		114 Fl flerovium -		116 Lv livermorium -		
lanthanoids																	
57 La lanthanum 139		58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium -	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175		
actinoids																	
89 Ac actinium -		90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium -	94 Pu plutonium -	95 Am americium -	96 Cm curium -	97 Bk berkelium -	98 Cf californium -	99 Es einsteinium -	100 Fm fermium -	101 Md mendelevium -	102 No nobelium -	103 Lr lawrencium -		

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).