KUO CHUAN PRESBYTERIAN SECONDARY SCHOOL

2019 PRELIMINARY EXAMINATION

Secondary 4 Express

NAME _____

CLASS _____ REG. NO _____

CHEMISTRY

6092/01

Paper 1 Multiple Choice

19 September 2019
1 hour

Additional Materials: Multiple Choice Answer Sheet.

Setter: Miss Pang Yin Yin

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and register number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

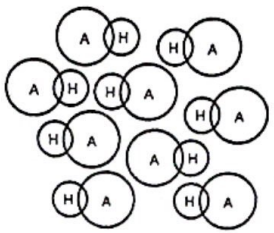
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 15.

The use of an approved scientific calculator is expected, where appropriate.

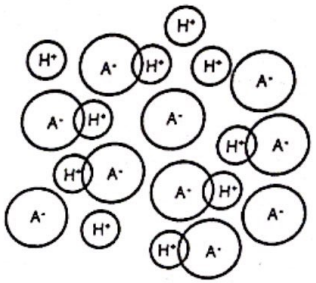
This document consists of 15 printed pages.

1 Dilute ethanoic acid (HA) ionise in water to form hydrogen ions (H^+) and acetate (A^-). Which set of diagrams correctly represents the particles of dilute ethanoic acid, hydrogen ions and acetate?

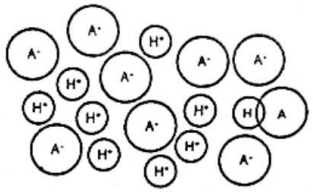
A



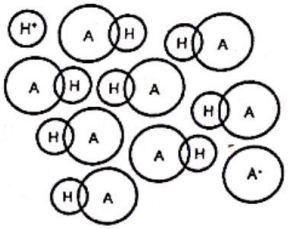
C



B



D



2 An ion X^+, has 23 nucleons and 10 electrons.
What does the nucleus of the ion X^+ contain?

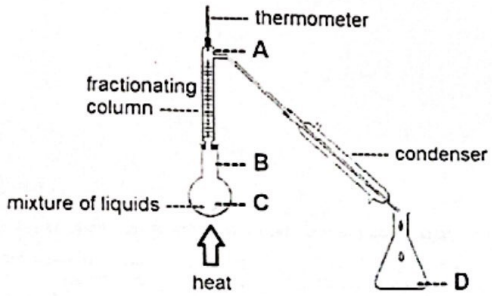
Legend: n = neutrons; p = protons ; e = electrons

A	10e	11p
B	10e	13n
C	11e	12n
D	11p	12n

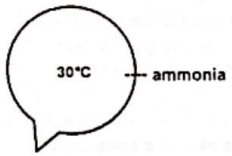
3 Which of the following has substances with high melting points?

A copper, sodium chloride, silicon dioxide
B diamond, carbon dioxide, methane
C glucose , poly(ethane), aluminium oxide
D graphite, lithium, magnesium oxide

4 A mixture of two liquids in equal proportions is fractionally distilled.
When the thermometer first shows a steady reading, at which point will there be a greater proportion of the liquid with the higher boiling point?



5 Which balloon will shrink at the fastest rate?

A


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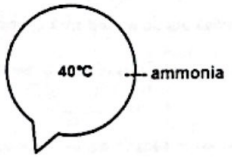

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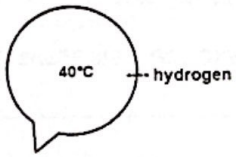

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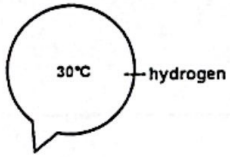
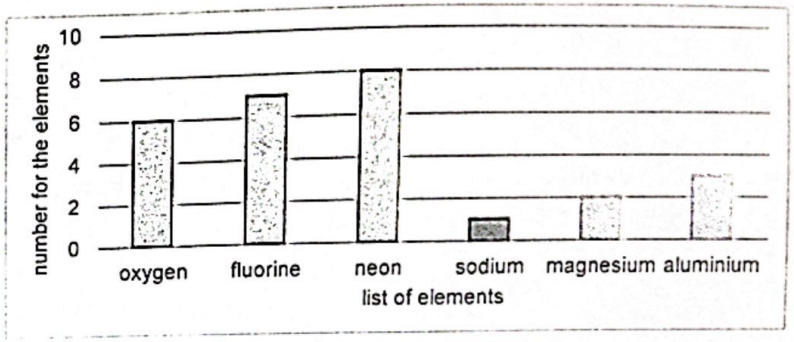


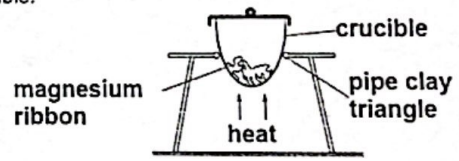
6 A number for the elements oxygen to aluminium are shown in the chart below



What is the number?

A charge on the ion
B electrons used during bonding
C group number
D valence electrons

7 In an experiment to find the formula of magnesium oxide, magnesium metal is heated in a covered crucible.



Why is the crucible covered with a loose fitting lid?

A To allow water vapour that was formed during the reaction to escape.
B To allow sufficient air from entering the crucible yet preventing magnesium oxide from escaping.
C To keep most heat within the crucible in so that reaction takes place in a shorter time.
D To save energy during heating which leads to cost saving.

8 An element burns in air to form a white solid.
This white solid dissolves in water to give an alkaline solution.
What is the element?

A aluminium
B calcium
C lead
D zinc

9 $5cm^3$ of 0.1 mol/dm^3 solution of a chloride of metal X needs 10 cm^3 of 0.1 mol/dm^3 silver nitrate for complete reaction. Accordingly, silver ions react with chloride ions according to the equation:

$$Ag^+ (aq) + Cl^- (aq) \rightarrow AgCl(s)$$

What is the formula of the chloride?

A XCl
B XCl_2
C XCl_4
D X_2Cl

10 Calcium reacts with water as shown:

$$Ca(s) + 2H_2O(l) \rightarrow Ca(OH)_2 (aq) + H_2(g)$$

What is the total mass of the solution that remains when 40g of calcium reacts with 100g of water?

A 58g
B 74g
C 138g
D 140g

11 Which equation represents the combustion of methane with the products collected at 120°C?

A $CH_4 (g) + 2 O_2 (l) \rightarrow CO_2 (s) + 2H_2O (l)$
B $CH_4 (g) + 2 O_2 (g) \rightarrow CO_2 (g) + 2H_2O (g)$
C $CH_4 (l) + 2 O_2 (g) \rightarrow CO_2 (g) + 2H_2O (l)$
D $CH_4 (l) + 2 O_2 (l) \rightarrow CO_2 (l) + 2H_2O (s)$

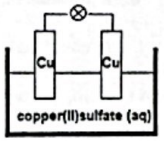
12 Nitrogen and hydrogen react in a closed vessel:

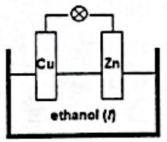
$$N_2(g) + 3H_2(g) \rightleftharpoons 2\ NH_3\ (g)$$

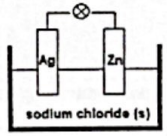
How do the speeds of the forward and reverse reactions change, if the pressure in the vessel is increased?

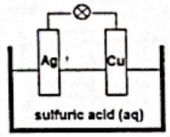
	Speed of forward reaction	Speed of backward reaction
A	decreases	does not change
B	decreases	increases
C	does not change	does not change
D	increases	increases

13 In which circuit does the light bulb light up?

A 

B 

C 

D 

14 Which statement is correct for all exothermic reactions?

A A catalyst is needed for the reaction to take place.
B Light is absorbed during the reaction.
C The products of the reaction have lesser energy than the reactants.
D They are reactions which require heat to start.

15 Which change **always** takes place when aqueous copper (II) sulfate is electrolysed?

A Copper is discharged at the negative electrode.
B Oxygen is evolved at the positive electrode.
C Sulfate ions move towards the negative electrode.
D The colour of the solution fades.

16 Element X is extracted by the electrolysis of a molten compound of elements X and Y. The electrode reactions are as shown:

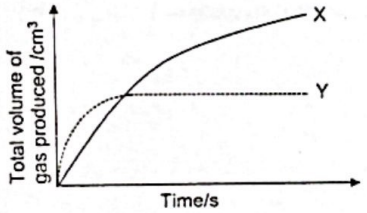
Cathode: $X^{2+}(l) + 2e^- \rightarrow X(l)$

Anode: $2Y^{2-}(l) \rightarrow Y_2(g) + 4e^-$

Which of the following could be the compound?

A aluminium oxide
B calcium chloride
C magnesium oxide
D potassium chloride

17 In the graph, curve X represents the results of the reaction between 1.0g of granulated iron and excess acid at 30°C.



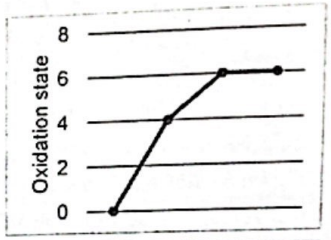
Which changes will produce curve Y?

A Using 0.5g of granulated iron at 20°C.
B Using 0.5g of granulated iron at 40°C.
C Using 1.0g of granulated iron at 20°C.
D Using 1.0g of powdered iron at 20°C.

18 The manufacture of sulfuric acid can be represented as follows:

$S \rightarrow SO_2 \rightarrow SO_3 \rightarrow H_2SO_4$

Which diagram shows the oxidation state of sulfur at each stage of the process?

A


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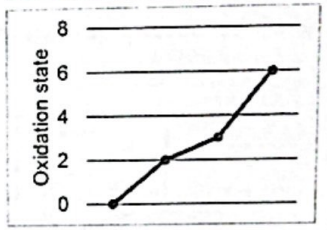

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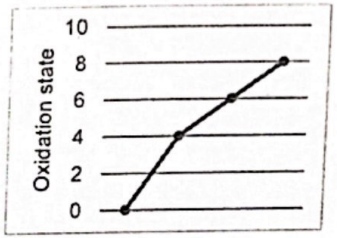

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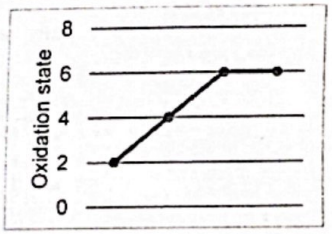


19 A solution X forms a white precipitate with dilute sulfuric acid and also with aqueous silver nitrate.
What could solution X contain?

A barium chloride
B barium nitrate
C magnesium chloride
D magnesium sulfate

20 An amphoteric oxide was added separately to an acid and of an alkali.
Which entry in the table is correct?

	acid	alkali
A	salt and water are formed	no visible observation
B	salt and water are formed	salt and water are formed
C	no visible observation	salt and water are formed
D	no visible observation	no visible observation

21 Which statement about the groups in the Periodic Table is correct?

A All groups contain both metals and non-metals.

B Atoms of elements in the same group have the same total number of electrons.

C In Group I, reactivity decreases with increasing proton number.

D In Group VII, the melting point of the elements increases with proton number.

22 Tellurium,Te, is in the same group as sulfur in the Periodic Table.
What is the formula of potassium telluride?

A K_2Te

B $KTeO_4$

C K_2TeO_3

D K_2TeO_4

23 The table gives the catalysts used in some industrial processes.

process/reaction	catalyst
cracking	aluminum oxide or silicon(IV) oxide
esterification	concentrated sulfuric acid
fermentation	yeast
haber	iron
manufacture of margarine	nickel

How many different transition metals are included in the list of catalyst?

A 1

B 2

C 3

D 4

24 Which of the following does **not** give hydroxide as a product?

A The adding of calcium chloride to aqueous sodium hydroxide.

B The adding of lithium to dilute hydrochloric acid.

C The adding of magnesium to steam.

D The electrolysis of concentrated sodium chloride.

25 When gas X is passed over heated copper (II) oxide, the products are copper and steam only.
What is gas X?

A ammonia

B carbon monoxide

C hydrogen

D methane

26 The table shows the results of adding weighed pieces of iron to solutions M and S.

solution used	initial mass of iron/g	final mass of iron after 15 minutes/g
M	5	4
S	5	4

What could be the aqueous solutions M and S be?

	M	S
A	copper (II) sulfate	silver nitrate
B	iron (II)chloride	calcium chloride
C	dilute hydrochloric acid	sodium chloride
D	magnesium chloride	dilute sulfuric acid

27 In which reaction does dilute sulfuric acid act as an oxidising agent?

A $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

B $ZnO + H_2SO_4 \rightarrow ZnSO_4 + H_2O$

C $Zn(OH)_2 + H_2SO_4 \rightarrow ZnSO_4 + 2\,H_2O$

D $ZnCO_3 + H_2SO_4 \rightarrow ZnSO_4 + H_2O + CO_2$

28 Old steel drums corrode quickly in a damp atmosphere but aluminium cans do not.
Which of the following correctly explains this behaviour of aluminium?

A Aluminium forms a layer of oxide.

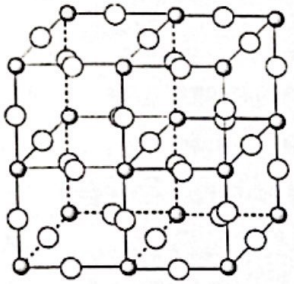
B Aluminium has a lower density than iron.

C Aluminium has 3 valence electrons.

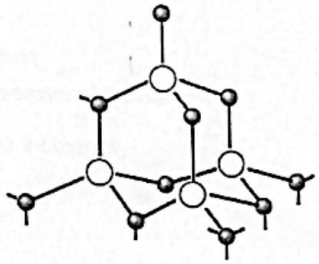
D Aluminium is placed above iron in the reactivity series.

29 Which diagram best represents the structure of an alloy?

A



C



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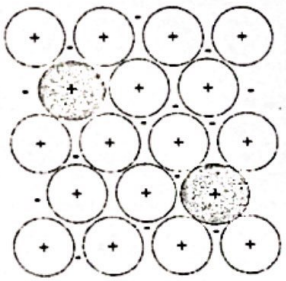

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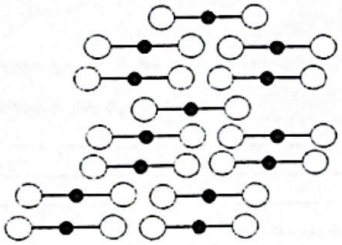


30 Which of the following gases is the main cause of greenhouse effect?

A carbon dioxide and methane
B nitrogen monoxide and water vapour
C nitrogen dioxide and sulfur dioxide
D unburnt hydrocarbons and ozone

31 Which compound, on combustion never forms soot?

A carbon monoxide
B ethanol
C ethene
D methane

32 In which process does large molecules become smaller molecules?

A catalytic reaction between ethene and steam
B fermentation of sugars
C oxidation of ethanol to form ethanoic acids
D reaction between alcohol and carboxylic acid

33 The structures of three hydrocarbons are given below:

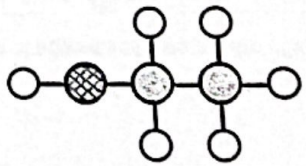
$CH_2 = C(CH_3)-CH_3$ $\qquad$ $CH_2 = CH - CH = CH_2$ $\qquad$ $CH_3 - CH_2 - CH = CH_2$

Which of the following statements about these hydrocarbons are correct?

1. They all undergo addition reactions.
2. On complete combustion of one mole of each, they give the same volume of carbon dioxide.
3. They are all isomers of the same hydrocarbons.

A 1 is correct.
B 1 and 2 are correct.
C 2 and 3 are correct.
D 1,2 and 3 are correct.

34 The diagram represents a compound that contains three different elements.



What could the compound be?

A C_2H_5OH
B C_3H_5Cl
C $(HCOO)_2Mg$
D NH_4NO_3

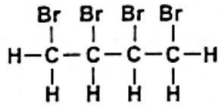
35 Which of the following reacts with sodium carbonate to produce carbon dioxide?

A CH_3COOCH_3
B $CH_3CH_2CHCl_2$
C CH_3CH_2COOH
D $CH_3CH_2CH_2OH$

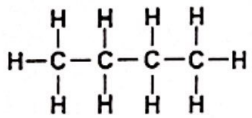
36 Which natural resources is being depleted by the manufacture of plastic?

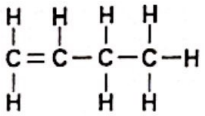
A air
B fossil fuel
C metal ores
D water

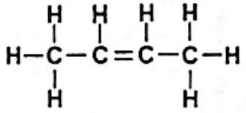
37 A hydrocarbon X reacts in darkness with bromine to form a compound with the formula shown:

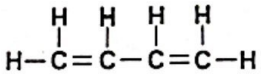


Which of the following represents hydrocarbon X?

A 

B 

C 

D 

38 Part of a polymer molecule has the following structure:

$$-CH_2-CH_2-CH_2-CH_2-CH_2-$$

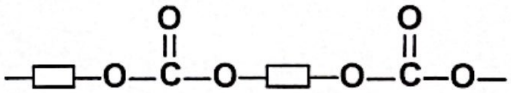
Identify the monomer used in making the polymer.

A C_2H_4
B C_2H_6
C C_3H_6
D C_3H_8

39 In the polymerisation of ethene to form poly(ethene), there is no change in

A boiling point
B density
C mass
D molecular mass

40 Polycarbonates are synthetic polymers. Their structures are shown:



Which of the following has a type of linkage similar to that of a poly(carbonate)?

A poly(amide)
B poly(ester)
C poly(ethene)
D poly(propene)

KUO CHUAN PRESBYTERIAN SECONDARY SCHOOL
2019 PRELIMINARY EXAMINATION
Secondary 4 Express

NAME

CLASS

REG. NO

CHEMISTRY

Paper 2

6092/02

30 August 2019
1 hour 45 minutes

No Additional Materials are required.

Setter: Miss Pang Yin Yin

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use a 2B pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.

Section A
Answer **all** questions in the spaces provided.
Write your answers in the spaces provided on the Question Paper.

Section B
Answer **all** three questions. The last question is in the form of either/or.
Answer **all** questions in the spaces provided.

Electronic calculators may be used.

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question. A copy of the Periodic Table is printed on page 18.

For Examiners' Use		
Section A		
7		
8		
Either 9	Or 9	
Total		

Parent's signature / Date

This document consists of 18 printed pages.

Section A

Answer **all** questions in this section in the spaces provided.

The total marks for this section is 50.

1 Helium is the second most abundant element in the universe. It has one naturally occuring isotope Helium-3. In 2017, scientists predicted two stable helium compounds with the formulae Na_2He and Na_2HeO.
Na_2He appeared at pressures of about 1.1 million times Earth's atmospheric pressure (1 a.t.m) while Na_2HeO was found to be stable in the pressure range from 0.15 to 1.1 million atmospheres. Na_2He exist as a type of ionic salt-like crystal. It has a positively charged sub-lattice of sodium ions and another negatively charged sub-lattice formed of localized electron pairs. Na_2HeO has a structure similar to Na_2He, but, in place of electron pairs, it has negatively charged oxygen in the form of O^{2-}. The theoretical discovery for these compounds could led to industrial uses for electrical applications.
Information adapted from: https://www.rdmag.com/news/2017/02/scientists-identify-two-stable-helium-compounds

(a) Compare and contrast the atomic structures of helium-3 and helium-4.

.....

..... [2]

(b) (i) State one unusual characteristic about helium as predicted by the scientists.

.....

..... [1]

(ii) Suggest a reason why the compounds could be synthesized if the predictions are accurate.

.....

..... [1]

(c) Deduce the application, with reason, if the compounds are to be used in electrical industry.

.....

..... [1]

2 Sodium nitride (Na_3N) is a solid with a melting point above 1000°C.
When sodium nitride is added to excess dilute hydrochloric acid, a violent reaction takes place, giving a solution **A** which contains two chloride salts.
When solution **A** is boiled with aqueous sodium hydroxide, a gas, **B** is evolved which turns damp litmus paper from red to blue.

(a) Identify gas **B** and include the method to collect a pure dry sample of it.

.....

..... [2]

(b) Name one salt present in solution **A**.

..... [1]

(c) Construct an equation for any of the reactions above.

..... [1]

(d) Draw the "dot and cross" diagram for sodium nitride. Show only valence electrons.

[2]

3 Hydrogen reacts with chlorine to produce hydrogen chloride.

$H_2\ (g) + Cl_2\ (g) \rightarrow 2\ HCl\ (g)$ $\quad \Delta H = -184$ kJ/mol

(a) Which is the larger of the energy change taking place in the reaction above, bond breaking or bond forming? Explain your answer.

.....

.....

.....

..... [3]

(b) Draw the energy profile diagram for the reaction above. Include the formulae for all chemicals, activation energy and enthalpy change.

[2]

(c) Calculate the energy change when 14.2 g of chlorine reacts completely with hydrogen.

[2]

(d) The reaction between hydrogen and chlorine is an example of a redox reaction.
Using the above equation, explain what is meant by a *redox* reaction.

.....

.....

.....

..... [2]

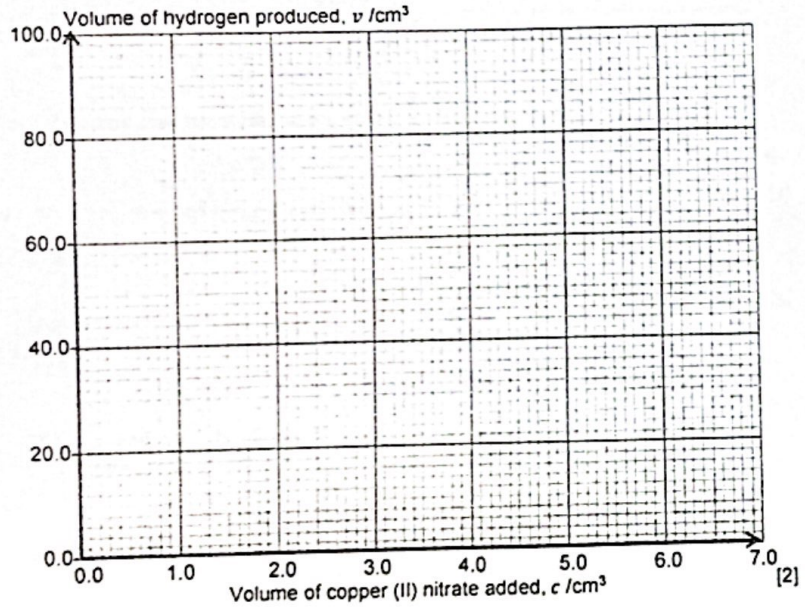
4 Pure zinc ribbons react with dilute nitric acid to produce hydrogen. During the experiment, 1.0 cm^3 of 1.0 mol/dm^3 copper (II) nitrate was added to this reaction and the volume of hydrogen gas produced was tabulated. The experiment was repeated using various volumes of copper (II) nitrate solution.
Table 4.1 shows the volume of hydrogen (v) measured at room temperature and pressure (r.t.p) when various volumes of copper (II) nitrate (c) was added to same mass of zinc (x g) each time.

Table 4.1

v /cm^3	100.0	83.0	66.0	50.0	33.0	16.0	0.0
c /cm^3	0.0	1.0	2.0	3.0	4.0	5.0	6.0

(a) Plot a graph of volume of hydrogen gas produced against volume of copper (II) nitrate added in **Graph 4.2**

Graph 4.2



[2]

(b) Which reagent, zinc or dilute nitric acid, should be added in excess to ensure highest yield of zinc nitrate formed? Explain your answer.

.....

..... [1]

(c) (I) From the shape of **Graph 4.2**, what can you deduce about the relationship between volume of copper (II) nitrate solution added and volume of hydrogen gas produced?

.....

..... [1]

(II) Provide an explanation for **c(I)**.

.....

.....

.....

..... [2]

(d) (i) Construct a chemical equation for the reaction between zinc and dilute nitric acid.

..... [1]

(ii) Use the graph and the equation in **d(I)**, calculate the value of x (mass of zinc) used in each experiment.

[2]

(e) Using ideas of collision theory, explain the effect of using zinc powder instead of zinc ribbon for the above reaction in the production of hydrogen gas.

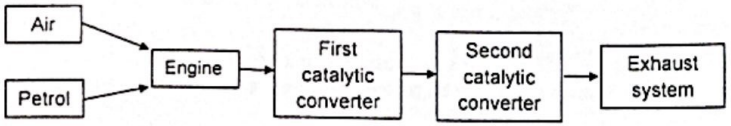
.....

.....

.....

..... [2]

5 (a) The exhaust gases of a motor car contain several pollutants, among them carbon monoxide and oxides of nitrogen. The flowchart below shows the arrangement of a two-stage catalytic converter in a motorcar engine and exhaust system.



In the first converter, carbon monoxide reacts with oxygen.
In the second converter, nitrogen oxides decomposes into nitrogen and oxygen.

(i) Describe how carbon monoxide and nitrogen oxides are produced in a car engine.

.....

.....

..... [2]

(ii) Give the names of the two harmless gases from the exhaust systems.

..... [1]

(b) Describe how petrol can be obtained from petroleum.

.....

.....

.....

.....

.....

..... [3]

(c) Nitrogen can also be produced by fractional distillation of air. Together with hydrogen obtained from cracking, both are essential reagents for the manufacturing of ammonia.

(i) The nitrogen and hydrogen are mixed in a specific ratio by volume. Write an equation for the manufacturing of ammonia in Haber process.

..... [1]

(ii) With the help of equation in (i), explain why the gases are mixed in the specific ratio.

.....

.....

..... [2]

(iii) The ammonia produced is essential in the manufacture of fertilisers. Ammonium nitrate, NH_4NO_3 and urea, $CO(NH_2)_2$ are both used in fertilisers. Ammonium nitrate is a '*fast release*' because it dissolves quickly in water. Explain in terms of particles, what happens when solid ammonium nitrate dissolves in water.

.....

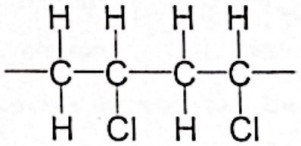
.....

..... [2]

(iv) From the formula, both fertilisers contain the same ratio of nitrogen. Show that 1 kg of urea contains more nitrogen than the same mass of ammonium nitrate.

[2

6 (a) C is a gaseous hydrocarbon and has a relative molecular mass of 28. It can undergo various addition reactions. C removes the reddish brown colour from aqueous bromine, forming a dense liquid D. C also undergoes addition reaction with hydrogen gas to form E and with hydrogen chloride to form an unsaturated product F. Compound F is used to manufacture polyvinylchloride (PVC) and the partial structure is :



Use the information to deduce the identity of compounds C to F.

C: ..... E: .....

D: ..... F: .....

[4]

(b) C can be obtained through catalytic cracking. An example would be pentadecane, $C_{15}H_{32}$ as it undergoes reaction to form alkanes and alkenes.

(i) Write an equation involving the cracking of pentadecane into ethene, propane and butene. Include the conditions necessary for this reaction.

..... [1]

(ii) Butene has a few isomers. Other than the straight chain structure, draw one of its isomers.

[1]

Section B

Answer all **three** questions in this section.

The last question is in the form of either/or and only one of the alternatives should be attempted.

7 (a) When concentrated sodium chloride is electrolysed using graphite electrodes initially, a colourless gas G was obtained at the cathode while a yellow green gas H was obtained at the anode. As the electrolysis continues for a period of time, the pale yellow green gas slowly fades and colourless gas I was obtained at the anode.

(i) Write the ionic equations at the electrodes that produces

gas G: .....

gas H: .....

gas I: ..... [3]

(ii) With the aid of the equations in a(i), describe the change that occurred from the beginning of the electrolysis till the end at the anode.

.....

.....

.....

..... [2]

(iii) Why is the electrolysis of concentrated hydrochloric acid not favourable despite the reaction yields the same products as concentrated sodium chloride?

.....

..... [1]

(b) **Fig. 7.1** represents the electroplating process of a tin medal with a layer of silver.

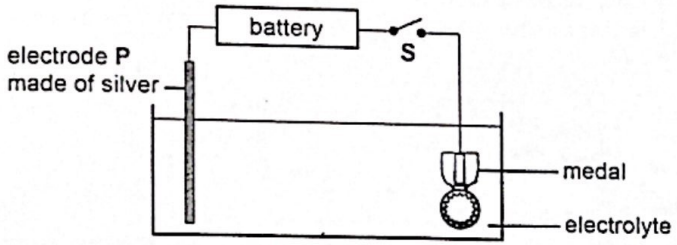


Fig. 7.1

(i) Suggest an identity of the electrolyte that can give the desired result for this electroplating.

..... [1]

(ii) Switch S is now closed.
State how will the concentration of this electrolyte will change (if any) during the electroplating process.

..... [1]

(iii) Describe with the aid of an equation, an observation that happens at electrode P.

.....

..... [2]

8 Some information about four elements, **W,X,Y** and **Z** are shown in the Table 8.1.

They can be arranged in the reactivity series as such:

Y > W > Z > hydrogen > **X** (decreasing reactivity)

Element	W	X	Y	Z
Number of electrons in outer shell	4	1	1	4
Density in g/dm^3	2.22	8.9	0.9	11.3
Melting point/°C	3720	1083	64	328
Atomic radius/pm	77	135	203	154
Charge on the ion(s)	Usually -4 and +4	Usually +1 and +2	+1	Usually +2 and +4
Colour of the element	Black	Reddish Brown	Silvery	Silvery
Formulae and appearance of the chlorides at room temperature	WCl_4 is a colourless liquid	XCl is a white solid XCl_2 is a blue-green solid	YCl is a white solid	ZCl_2 is a white solid ZCl_4 is a yellow liquid

(a) Which one of the following, **W,X,Y** and **Z**,

(i) is a transition element? Give 2 pieces of evidence from the table to support your answer.

.....

..... [2]

(ii) is from Group I? Give 2 pieces of evidence from the table to support your answer.

.....

..... [2]

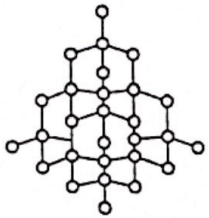
(b) Element **Y** will react with dilute hydrochloric acid to give hydrogen gas. Construct an equation for this reaction.

..... [1]

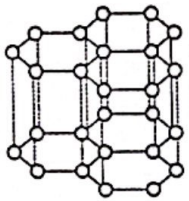
(c) State one observation when **Z** is placed in aqueous **X** nitrate.

..... [1]

(d) W exists as 2 allotropes.



allotrope 1



allotrope 2

(i) Draw the "dot and cross" diagram for WCl_4. Show only valence electrons.

[2]

(ii) Pure iron is soft. With the aid of a diagram, explain why the addition of small amount of element **W** can make pure iron strong enough to be used to manufacture high strength wires.

.....

.....

..... [2]

EITHER

9 Ethanol is used in Brazil as a liquid fuel instead of gasoline. The ethanol is manufactured by a fermentation process from sugar cane.

(a) (i) Describe how pure ethanol can be obtained by converting sugar cane using the process of fermentation.

.....

.....

.....

..... [2]

(ii) Give one use of ethanol apart from its use in fuel.

..... [1]

(b) Ethanol reacts with sodium to give sodium ethoxide (C_2H_5ONa) and hydrogen. Sodium ethoxide reacts with propanoyl chloride (CH_3CH_2COCl) to give a sweet smelling liquid, **G** and sodium chloride.

(i) Construct a balance equation between sodium ethoxide and propanoyl chloride.

..... [1]

(ii) Name the sweet smelling liquid, **G**.

..... [1]

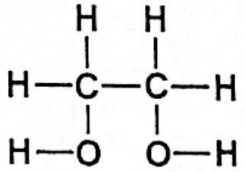
(iii) Name and draw the structure of a macromolecule (at least 2 repeating units) which contains the same linkage as that of the compound in **b(ii)**.

Name of the macromolecule: .....

Structure of the macromolecule:

[3]

(c) Another form of alcohol is diol, which contains two hydroxyl (-OH) groups. Ethane-1,2-diol has the following structural formula:



It is a colourless liquid which is used as an antifreeze in car radiators. Chemicals which prevent oxidation are added to ethane-1,2 diol when it is used as an antifreeze.

(i) What class of compound will be formed when ethane-1,2 diol is oxidised?

..... [1]

(ii) Suggest what may happen to a radiator made of iron if the substance named in c(I) was formed?

..... [1]

OR

9 Both nylon and poly(propene) are polymers. Unlike poly(propene), nylon reacts (hydrolyses) with dilute acids; the linkages are broken and eventually end up with the monomers.

(a) Compare and contrast the structure and bonding of nylon and polypropene. Your answer should include the types of polymerisation it undergoes, the monomers that made up the macromolecules and the linkages that joined the monomers.

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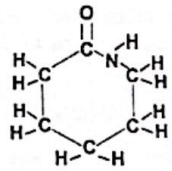
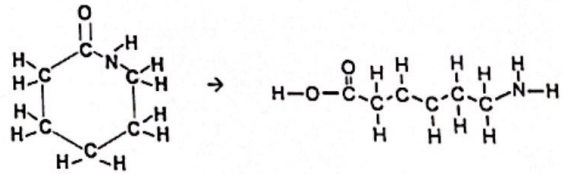
(b) It is possible to synthesize nylon from a single monomer. Nylon-6 is made from a monomer, caprolactam, $(CH_2)_5CONH$:



When this molecule is heated at around 260°C, in an inert atmosphere of nitrogen, the ring opens with the active groups on both sides reforming 2 new bonds as the monomer $HOOC(CH_2)_5NH_2$.



The monomers then join up in a continuous chain.

(i) Draw the partial structures of Nylon-6 showing at least 2 repeat units.

[2]

(ii) Both poly(propene) and nylon can be used to make apparels. Suggest the effect when dilute sulfuric acid reacts with each of the apparels made by the polymers.

.....

..... [2]