Past Papers

Standard Grade

Credit

Chemistry

2001

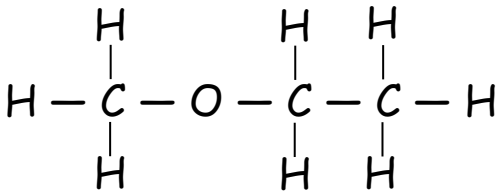
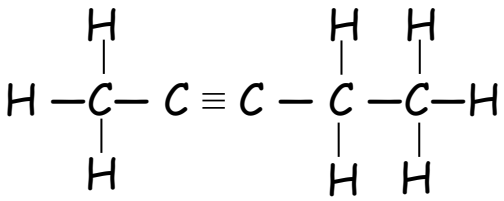
Marking Scheme

2001 Standard Grade Chemistry Credit Marking Scheme

Question	Answer	Chemistry Covered
1a	E	zinc is higher up reactivity series than iron so protects it sacrificially
1b	A	iron is higher up reactivity series than tin so protects it sacrificially
2a	A+F Both for 1 mark	Fair Test: Factors Affecting Reaction Rate Question Particle size is changing so temp and concentration and type of acid must be the same
2a	A+F Both for 1 mark	Experiments **A+F** | *Same* Temperature (20°C) | *Same* Concentration (1 mol/l) | *Same* Metal (Magnesium) | **Different** Particle Size (powder or ribbon)
2b	B	Copper is below hydrogen in the electrochemical series. Copper does not react with dilute acids ∴ experiment B has no reaction.
3a	C+E Both for 1 mark	Answer | A | B | C | D | E | F Particle | $^{24}_{11}Na$ | $^{14}_{6}C$ | $^{19}_{9}F$ | $^{24}_{12}Mg^{2+}$ | $^{19}_{9}F^{-}$ | $^{12}_{6}C$ no. of neutrons | 13 | 8 | **10** | 12 | **10** | 6
3b	B+F Both for 1 mark	Isotopes: same number of protons but different number of neutrons Answer | A | B | C | D | E | F Particle | $^{24}_{11}Na$ | $^{14}_{6}C$ | $^{19}_{9}F$ | $^{24}_{12}Mg^{2+}$ | $^{19}_{9}F^{-}$ | $^{12}_{6}C$ no. of protons | 11 | **6** | 9 | 12 | 9 | **6** no. of neutrons | 13 | **8** | 10 | 12 | 10 | **6**
3c	D+E Both for 1 mark	Answer | A | B | C | D | E | F Particle | $^{24}_{11}Na$ | $^{14}_{6}C$ | $^{19}_{9}F$ | $^{24}_{12}Mg^{2+}$ | $^{19}_{9}F^{-}$ | $^{12}_{6}C$ Electron Arrangement of Element | 2,8,1 | 2,4 | 2,7 | 2,8,2 | 2,7 | 2,4 Electron Arrangement of Ion | | | | **2,8** | **2,8** |
4a	D	glucose $\xrightarrow[\text{(no air)}]{\text{yeast enzymes}}$ ethanol + carbon dioxide $C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$
4b	C	starch + water $\longrightarrow$ glucose $(C_6H_{12}O_5)_n + nH_2O \longrightarrow nC_6H_{12}O_6$
4c	E	glucose + oxygen $\longrightarrow$ carbon dioxide + water $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$
5a	A+D Both for 1 mark	Bases neutralise acids. Bases include metal hydroxides (alkalis), metal oxides and metal carbonates
5b	F	Salts made by precipitation must be insoluble in water: Answer | A | B | C | D | E | F Chemical | sodium hydroxide | potassium nitrate | sodium chloride | lithium nitrate | sodium phosphate | barium sulphate Solubility | soluble | soluble | soluble | soluble | soluble | insoluble
6	A, C 1 mark each	**Particle** | **Location** | **Charge** | **Mass** Proton | in nucleus | +1 | 1 amu Neutron | in nucleus | 0 | 1 amu Electron | outside nucleus | –1 | approx. zero
7	B, D 1 mark each	☒A Glucose $C_8H_{12}O_6$ is covalent so glucose solution does not conduct. ☑B Metals conduct in both solid and liquid states so bulb lights as circuit is complete ☒C Hexane C_6H_{14} is covalent so hexane does not conduct ☑D both ionic substances which conduct in either liquid or solution states. ☒E Potassium nitrate KNO_3 is ionic so does not conduct in the solid state.

8	A, B 1 mark each	☑A Cu^{2+} ions are blue and NO_3^- ions are colourless ∴ $Cu(NO_3)_2$ is blue ☑B all the coloured ions in the table contain transition metals ☒C The permanganate ion contains oxygen but is purple ☒D Zinc is a transition metal but has no colour ☒E Lithium compounds are only colourless if paired with a colourless negative ion
9	A, C 1 mark each	☑A Both compounds (ammonia and carbon dioxide) have the highest critical temperatures ☒B There is no pattern to relative formula mass and critical temperature ☑C Both diatomic elements (H_2 and O_2) have higher critical temperatures than monatomic He ☒D Carbon dioxide is only able to be a liquid at temperatures below 31°C

Question	Answer	Chemistry Covered
10a	no effect	C_5H_{12} is pentane. Alkanes do not decolourise bromine solution
10b	cyclohexane	C_6H_{12} can be hexene or cyclohexane. As bromine solution is not decolourised it cannot have C=C double bonds ∴ B is cyclohexane
10c	isomers	Isomers have the same formula but have different structures: • C is a cycloalkane with five carbons e.g. cyclopentane • D is an alkene with 5 carbons e.g. pent-1-ene, pent-2-ene, etc.
11a	hydrogen	very reactive metal + water ⟶ salt + hydrogen • potassium, sodium, lithium and calcium all react with water this way.
11b	W: Pt, Au, Ag or Hg Y: K, Na, Li, Ca or Mg	W must be the least reactive metals if heating alone releases the metal from the ore. Y must be the most reactive metals if they react with cold water.
11c	Y, X, Z, W	Y is most reactive as it is the only one which reacts with water W is the least reactive as it is the only metal which releases it metal when heated X is more reactive than Z as X displaces X from a solution of X
11d	Reduction	Reduction is gain of electrons e.g. $M^{2+} + 2e^- \longrightarrow M$
12a	$CH_4 + 2O_2$ ↓ $CO_2 + 2H_2O$	$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$
12b	SO_2 produced forming acid rain	Compounds containing sulphur burn to form SO_2 SO_2 dissolves in water to form acid rain
12c	48g	1mol H_2S = (2x1) + (1x32) = 2 + 32 = 34g no. of mol = mass / gfm = 34g / 34g mol^{-1} = 1mol $2H_2S + SO_2 \longrightarrow 2H_2O + 3S$ 2mol → 3mol 1mol → 1.5mol 1mol S = 32g mass = no. of mol x gfm = 1.5mol x 32g mol^{-1} = 48g
12d(i)	line graph	½ mark both labels with units; ½ mark both scales; ½ mark points plotted correctly; ½ mark points joined
12d(ii)	higher the temperature the lower the solubility	problem solving question
13a(i)	ammonium phosphate	Data booklet p8 gives names of NH_4^+ and PO_4^{3-} ions
13a(ii)	to replace the nutrients in soil and help plant growth	Fertilisers are soluble salts containing potassium, nitrogen and/or phosphorus
13b	nitric acid	Acid: Hydrochloric, Sulphuric, Nitric Salt Name ending: chloride, sulphate, nitrate
13c(i)	does not melt on heating	thermosetting: does not melt on heating thermoplastic: does melt on heating
13c(i)	46.7%	gfm $CO(NH_2)_2$ = (1x12) + (1x16) + (2x14) + (4x1) = 12 + 16 + 28 + 4 = 60g %N = mass of N / gfm x 100 = 28/60 x 100 = 46.67%
14a	higher mass of ions in Dead Sea than Ocean	Problem Solving Question
14b	One answer from:	sodium chloride/bromide/sulphate; potassium chloride/bromide/sulphate; magnesium chloride/bromide/sulphate; calcium chloride/bromide/sulphate
14c	0.01mol l^{-1}	1mol Ca = 40g no. of mol = mass / gfm = 0.4g / 40g mol^{-1} = 0.01mol concentration = no. of mol / volume = 0.01mol / 1 litre = 0.01mol/l

<table>
<tr><td>15a</td><td>Arrow from B (RIGHT) to A (LEFT) through wires</td><td>Electrons travel through wires (not solution)
From Question: Reaction in beaker B produces electrons</td></tr>
<tr><td>15b(i)</td><td>Oxidation</td><td>Oxidation is loss of electrons (electrons right of arrow)</td></tr>
<tr><td>15b(ii)</td><td>pH decreases</td><td>H^+ ions (acid) produced as reaction proceeds</td></tr>
<tr><td>15c</td><td>$Br_2 + 2e^- \rightarrow 2Br^-$</td><td>Equation on page 10 of data booklet</td></tr>
<tr><td>16a</td><td>Iron</td><td>Nitrogen + Hydrogen $\xrightarrow{\text{iron}}$ Ammonia</td></tr>
<tr><td>16b</td><td>Ammonium salt + metal hydroxide</td><td>Any Ammonium salt will react with strong alkali solids like (NaOH, KOH) to form Ammonia NH_3 gas</td></tr>
<tr><td>16c</td><td>Answer to include:</td><td>2 electrons form a shared pair between atoms.
Atoms must be set distance apart for electrons to form a stable pair instead of remaining as two unpaired electrons</td></tr>
<tr><td>17a</td><td>a family of compounds with similar chemical properties and a general formula</td><td>
<table>
<tr><td>Homologous Series</td><td>Alkane</td><td>Alkene</td><td>Cycloalkane</td><td>Alcohol</td><td>Carboxylic Acids</td></tr>
<tr><td>General Formula</td><td>C_nH_{2n+2}</td><td>C_nH_{2n}</td><td>C_nH_{2n}</td><td>$C_nH_{2n+1}OH$</td><td>$C_nH_{2n+1}COOH$</td></tr>
</table>
</td></tr>
<tr><td>17b(i)</td><td>hydrogen H_2</td><td>
<table>
<tr><td>Element</td><td>Carbon</td><td>Hydrogen</td><td>Bromine</td><td>Oxygen</td><td>Sodium</td></tr>
<tr><td>Reactant Side</td><td>6</td><td>18</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>Product Side</td><td>6</td><td>16</td><td>2</td><td>2</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>17b(ii)</td><td>Answer showing:</td><td>  </td></tr>
<tr><td>18a</td><td>precipitation</td><td>Magnesium hydroxide is insoluble:
$Mg^{2+}(aq) + Ca^{2+}(OH^-)_2(aq) \longrightarrow Ca^{2+}(aq) + Mg^{2+}(OH^-)_2(s)$</td></tr>
<tr><td>18b</td><td>$Ca^{2+}(OH^-)_2$</td><td>
<table>
<tr><td>Write down Valency below each ion's symbol
Ca OH
2 1</td><td>Put in Cross-over Arrows
Ca OH
2 1</td><td>Follow arrows and cancel down to get formula
$Ca(OH)_2$
Work out charges on ions. If more than one of ion put ion in brackets and number outside
$Ca^{2+}(OH^-)_2$</td></tr>
</table>
</td></tr>
<tr><td>18c</td><td>carbon dioxide or carbon monoxide</td><td>$MgO + C + Cl_2 \longrightarrow MgCl_2 +$ CO / CO_2</td></tr>
<tr><td>18d</td><td>ions free to move when molten</td><td>Solid ionic compounds do not conduct as their ions are not free to move. Melting or dissolving free up the ions and they are able to move during electrolysis.</td></tr>
<tr><td>19a</td><td>C_nH_{2n-2}</td><td>Alkanes have general formula of C_nH_{2n+2}. The C=C double bond in Alkenes changes general formula to C_nH_{2n}. A triple bond reduces the number of hydrogens again down to C_nH_{2n-2}.</td></tr>
<tr><td>19b(i)</td><td>Diagram showing:</td><td>  </td></tr>
<tr><td>19b(ii)</td><td>Bromine atoms must be on adjacent carbons</td><td>The bromines must be an carbons next to each other if a triple bond is to be formed</td></tr>
</table>