RIVER VALLEY HIGH SCHOOL
YEAR 6 PRELIMINARY EXAMINATION

CANDIDATE NAME								
CLASS	6							
CENTRE NUMBER	S					INDEX NUMBER		

H2 CHEMISTRY 9647/01

Paper 1 Multiple Choice **21 September 2012**

1 hour

Additional Materials:Multiple Choice Answer Sheet
Data Booklet

READ THESE INSTRUCTIONS FIRST

Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class, centre number and index number on the Answer Sheet in the spaces provided.

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.

This document consists of **16** printed pages.

Section A

For each question there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider to be correct.

1 Methane was burned with a faulty Bunsen burner. As a result, a mixture of carbon dioxide and carbon monoxide was produced in a ratio of 98:2, together with water vapour.

What was the volume of oxygen gas used when y dm^3 of methane was burned?

A $(2y - \frac{0.01}{2}y)$ dm^3

B $(2y - 0.01y)$ dm^3

C $(y - \frac{0.01}{2}y)$ dm^3

D $(y - 0.01y)$ dm^3

2 An ion of metal **M** can be oxidised by potassium manganate(VII) in acid solution to form MO_3^-. In an experiment, 1.25 ´ 10^{-3} mol of the ion of **M** required 37.5 cm^3 of 0.0200 mol dm^{-3} potassium manganate(VII) for complete reaction.

What is the initial oxidation state of the ion of **M**?

A +1 **B** +2

C +3 **D** +4

3 Which of the following statements best explains why the boiling point of $CH_3CH_2CH_2NH_2$ is higher than that of $(CH_3)_3N$?

A There are hydrogen bonds between $CH_3CH_2CH_2NH_2$ molecules but no hydrogen bonds between $(CH_3)_3N$ molecules.

B The covalent bonds between atoms in $CH_3CH_2CH_2NH_2$ are stronger than those between atoms in $(CH_3)_3N$.

C $CH_3CH_2CH_2NH_2$ molecule has a larger surface area than $(CH_3)_3N$ molecule.

D $CH_3CH_2CH_2NH_2$ molecule is polar but $(CH_3)_3N$ molecule is not.

4 Which of the following electrostatic attraction is **not** present in a sample of CH_3F?

A permanent dipole-permanent dipole interactions

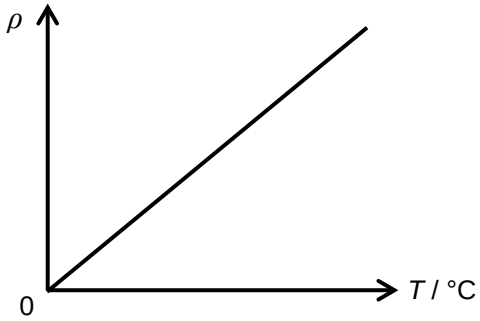
B instantaneous dipole-induced dipole interactions

C hydrogen bonds

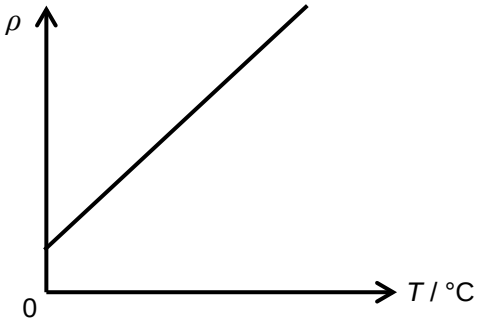
D covalent bonds

5 Which of the following graph is obtained when density (ρ) is plotted against temperature (T) for an ideal gas under constant pressure?

A



B



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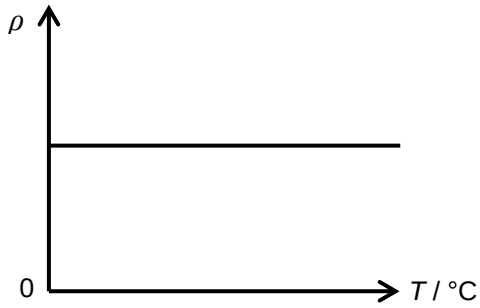

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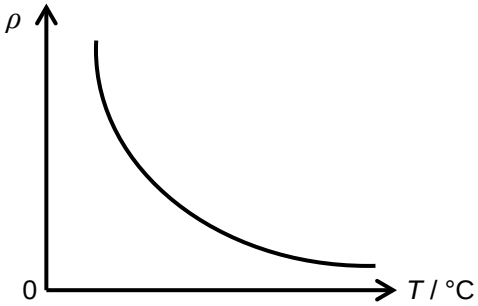


6 Which of the following oxides is unlikely to dissolve in aqueous sodium hydroxide?

A MgO **B** Al_2O_3

C SiO_2 **D** SO_2

7 Nitrogen dioxide decomposes on heating according to the following equation.

$$2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$$

When 2 mol of nitrogen dioxide is placed in a 4 dm^3 container and heated, the equilibrium mixture contained 0.8 mol of oxygen.

What is the numerical value of the equilibrium constant, K_c, at the temperature of the experiment?

A 0.0889 **B** 0.800

C 3.20 **D** 12.8

8 Which statement about the effect of a catalyst on a reversible reaction is correct?

A It increases the yield of product in an equilibrium.

B It increases the equilibrium constant for the forward reaction.

C It increases the rate of the forward reaction and decreases the rate of the reverse reaction.

D It increases the rate constant for both the forward and the reverse reaction.

9 Which expression represents the solubility product of iron(III) hydroxide?

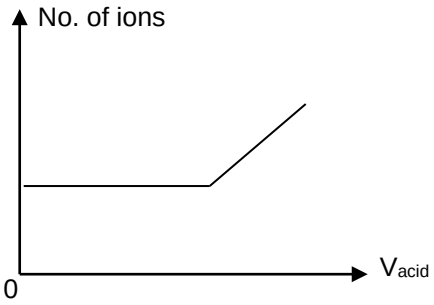
A $[Fe^{3+}][OH^-]$ **B** $[Fe^{3+}][OH^-]^3$

C $[Fe^{3+}][3OH^-]$ **D** $[Fe^{3+}][3OH^-]^3$

10 $H_2SO_4(aq)$ was added to $Ba(OH)_2(aq)$ until the acid was in excess.

Which graph shows the variation in the total number of ions in solution?

A



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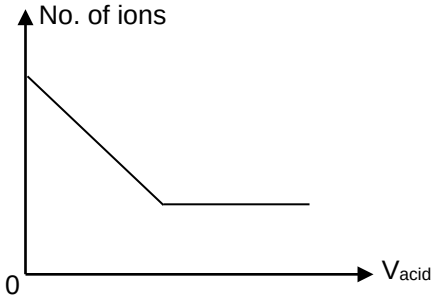

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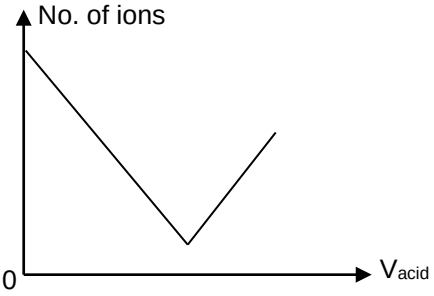
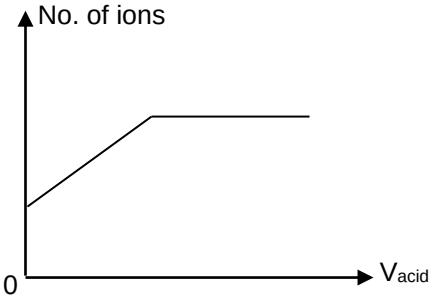


D

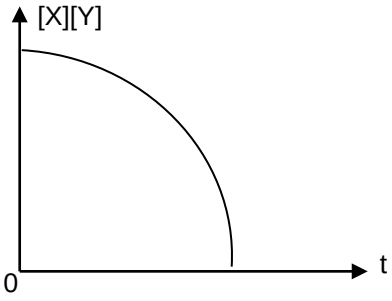


11 The product of the concentrations of X and Y, [X][Y], is plotted against time, t, for the following second-order reaction.

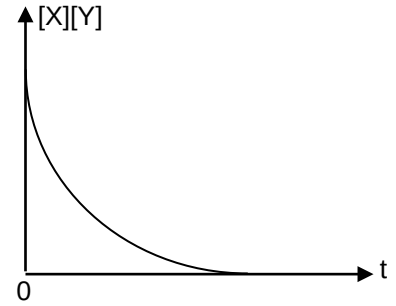
$$X + Y \rightarrow Z$$

Which graph would be obtained?

A



B



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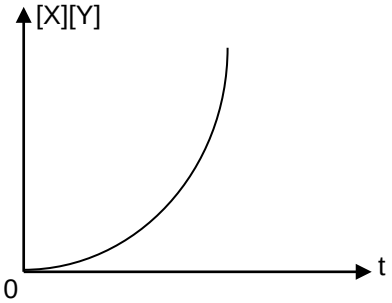
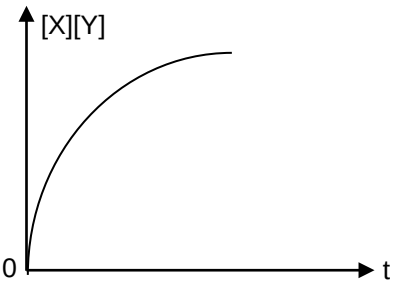


D



12 Which one of the following elements has the same oxidation state in all of its known compounds?

A beryllium **B** bromine

C nitrogen **D** sulfur

13 **X** is obtained by reacting aqueous cobalt(III) chloride with ammonia. The co-ordination number of cobalt is 6 and when the complex is treated with an excess of aqueous silver nitrate, only ⅓ of the total chloride is precipitated as AgC*l*.

What is the formula of **X**?

A $Co(NH_3)_6Cl_3$ **B** $Co(NH_3)_5Cl_3$

C $Co(NH_3)_4Cl_3$ **D** $Co(NH_3)_3Cl_3$

14 Using relevant $E^{\ominus}$ values from the *Data Booklet*, determine which of the following statements is correct.

A No reaction occurs when $V^{3+}(aq)$ is added to $Fe^{3+}(aq)$.

B $VO^{2+}(aq)$ can reduce $Fe^{2+}(aq)$ to $Fe^{3+}(aq)$.

C $Zn^{2+}(aq)$ can reduce $VO^{2+}(aq)$ to $V^{3+}(aq)$.

D Zn(s) can reduce $V^{3+}(aq)$ to $V^{2+}(aq)$.

15 A current of 8 A is passed for 100 min through molten aluminium oxide using inert electrodes.

What will be the approximate volume of gas liberated, measured at s.t.p.?

A 2.8 dm^3 **B** 3.0 dm^3

C 11.2 dm^3 **D** 12.0 dm^3

16 Which one of the following products is **not** obtained commercially by the electrolysis of concentrated brine?

A chlorine **B** oxygen

C sodium chlorate(V) **D** sodium hydroxide

17 *Use of the Data Booklet is relevant to this question.*

In the construction of pacemakers for the heart, a tiny magnesium electrode can be used to create an electrical cell with the inhaled oxygen. The relevant half-equations are as shown:

$$Mg^{2+} + 2e^- \rightleftharpoons Mg$$

$$\tfrac{1}{2}\, O_2 + 2H^+ + 2e^- \rightleftharpoons H_2O$$

In the body, a potential of 3.20 V is usually obtained. What is the best explanation for this e.m.f.?

A The small size of the magnesium electrode

B The low concentration of Mg^{2+} surrounding the magnesium electrode

C The high resistance of the body fluids surrounding the electrodes

D The physiological pH of between 7 and 8 of the body fluid surrounding the electrodes

18 *Use of the Data Booklet is relevant to this question.*

The enthalpy changes for three reactions are given below:

$Na(s) \rightarrow Na(g)$ $\Delta H_1 = +107$ kJ mol^{-1}

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ $\Delta H_2 = -58$ kJ mol^{-1}

$2Na^+(g) + 2H^+(aq) + 2e^- \rightarrow 2Na^+(aq) + H_2(g)$ $\Delta H_3 = -1700$ kJ mol^{-1}

What is the enthalpy change for the following reaction?

$$Na(s) + H_2O(l) \rightarrow Na^+(aq) + OH^-(aq) + \tfrac{1}{2}H_2(g)$$

A −191 kJ mol^{-1} **B** −307 kJ mol^{-1}

C −685 kJ mol^{-1} **D** −1041 kJ mol^{-1}

19 The bond dissociation energy of H−C*l* is 431 kJ mol^{-1}. In which of the following processes is 431 kJ of energy released?

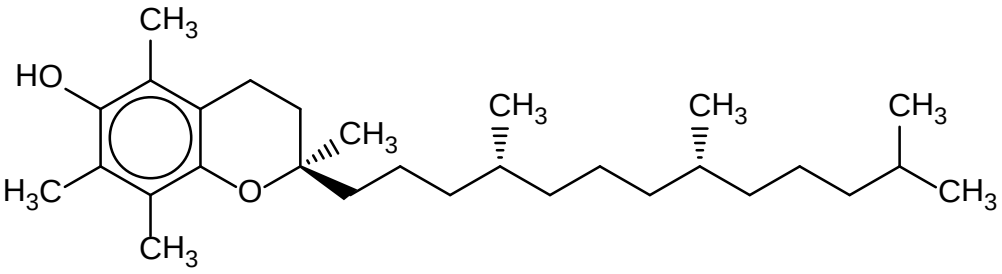
A $HCl(g) \rightarrow H(g) + Cl(g)$

B $H(g) + Cl(g) \rightarrow HCl(g)$

C $HCl(g) \rightarrow \tfrac{1}{2}H_2(g) + \tfrac{1}{2}Cl_2(g)$

D $\tfrac{1}{2}H_2(g) + \tfrac{1}{2}Cl_2(g) \rightarrow HCl(g)$

20 Vitamin E acts as an antioxidant as well as an enzymatic activity regulator. There are 8 forms of Vitamin E, of which a-tocopherol is the most biologically active form. The diagram shows the structure of a-tocopherol.



How many chiral carbon centres are there in one molecule of a-tocopherol?

A 2 **B** 3 **C** 4 **D** 5

21 Which of the following could be best used to distinguish between hex-1-ene and methylbenzene?

A acidified $K_2Cr_2O_7$

B Br_2 in CCl_4

C I_2 in NaOH(aq)

D concentrated sulfuric acid

22 Samples of the gases CH_3Cl and Cl_2 are mixed together and irradiated with light.

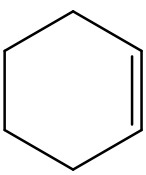
Which compound is produced by a termination stage in the chain reaction?

A HCl **B** $CH_2=CH_2$

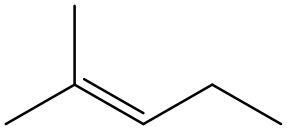
C CH_3CH_3 **D** CH_2Cl_2

23 Which hydrocarbon, on treatment with hot acidified potassium manganate(VII), would give ethanoic acid as one of the products?

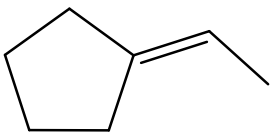
A



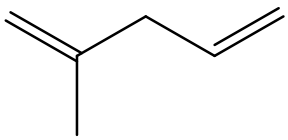
B



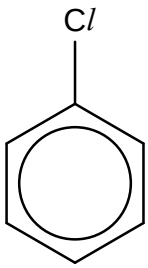
C

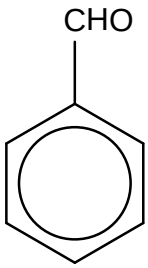


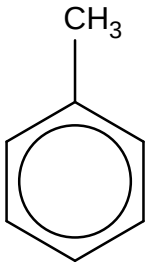
D

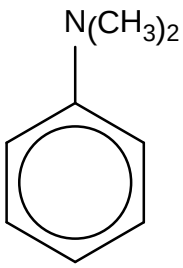


24 Which of the following compounds would undergo electrophilic substitution most readily?

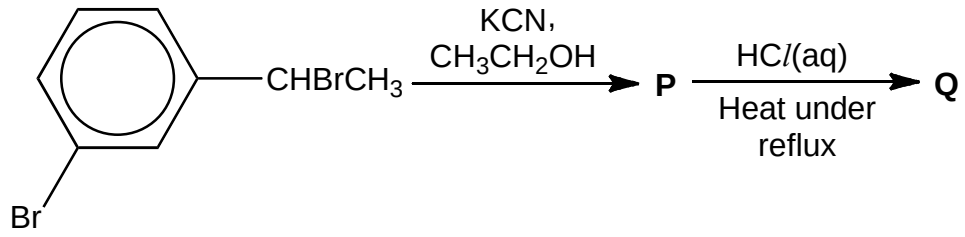
A 

B 

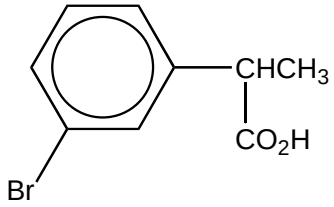
C 

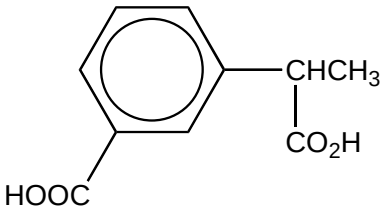
D 

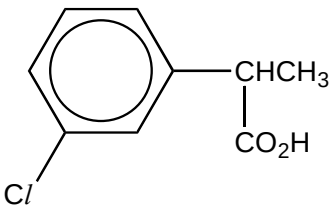
25 A reaction sequence is given below.

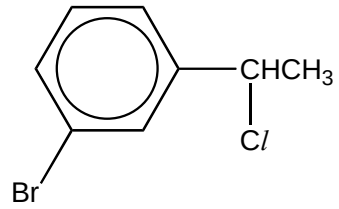


Which of the following structures represents the product **Q**?

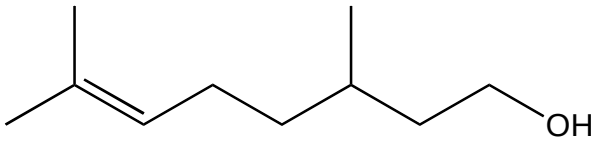
A 

B 

C 

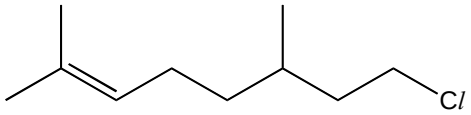
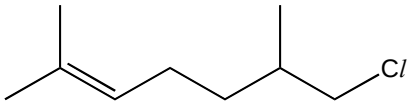
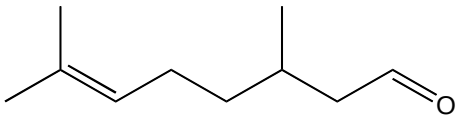
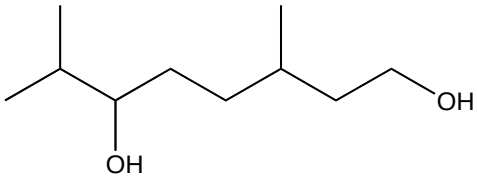
D 

26 *Citronellol* is a colourless oily liquid with a rose-like smell. It is the active ingredient in over 30 essential oils and is a major component in perfumes, cosmetics and soaps. It may be prepared synthetically from compound **S** using reagent **T**.



Citronellol

Which of the following could **S** and **T** most likely be?

	S	**T**
A		KOH in ethanol
B		aqueous NaOH
C		LiA/H_4 in dry ether
D		concentrated H_2SO_4 at 170 °C

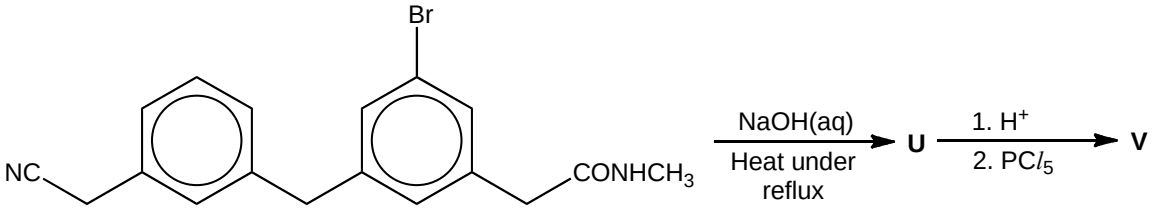
27 One mole of compound **R** reacts with excess sodium metal to give one mole of hydrogen gas. One mole of ammonia gas is also evolved when one mole of compound **R** is heated with aqueous sodium hydroxide.

What is the identity of **R**?

A $HOCH_2CH(NH_2)CO_2H$ **B** $HOCH_2CH(OH)CN$

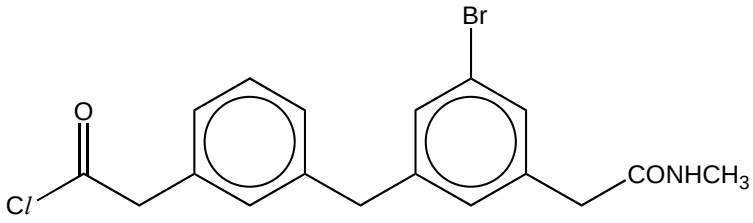
C $HOCH_2CH_2CONH_2$ **D** $HOCH_2CH(NO_2)CO_2H$

28 The reaction scheme below shows the formation of compound **V**.

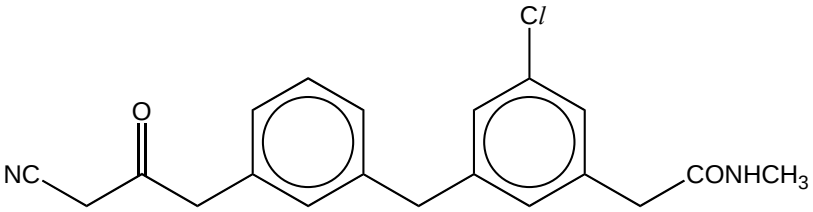


What is the structure of **V**?

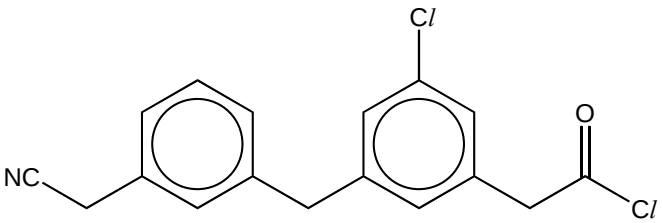
A



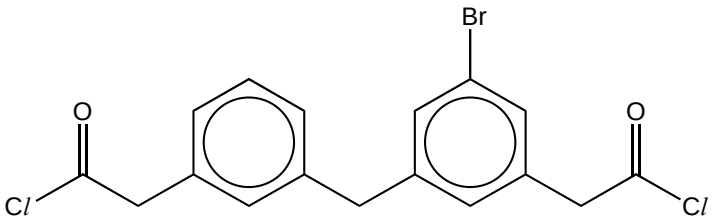
B



C



D



29 Which of the following statements explains why ethylamine has a lower pK_b value than ammonia? (pK_b of ethylamine = 3.2; pK_b of ammonia = 4.8)

A The nitrogen atom in ammonia is bonded to more hydrogen atoms than that in ethylamine.

B The conjugate acid of ethylamine is less stable than that of ammonia.

C Ethyl group in ethylamine increases the electron density of the nitrogen atom.

D The lone pair on the nitrogen atom of ammonia is less delocalised than that on ethylamine.

30 Denaturation of proteins occurs due to the destruction of the tertiary structure where various R group interactions are disrupted by external factors such as extreme pH and heavy metal ions.

Which of the following **incorrectly** shows the R group interactions that will be affected by such external factors?

	R group interactions	External factor
A	hydrogen bonds	extreme pH
B	disulfide bridges	extreme pH
C	disulfide bridges	heavy metal ions
D	ionic interactions	heavy metal ions

Section B

For each of the questions in this section, one or more of the three numbered statements **1** to **3** may be correct.

Decide whether each of the statements is or is not correct. (You may find it helpful to put a tick against the statements that you consider to be correct).

The responses **A** to **D** should be selected on the basis of

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

31 Which statements about the electronegativity of elements in the Periodic Table are correct?

1 In Period 3, it decreases from sodium to chlorine.

2 In Group II, it decreases from beryllium to barium.

3 In Group VII, it decreases from fluorine to iodine.

32 When light is shown for a fixed period into a solution of CH_2ICH_2I and I_2 in tetrachloromethane at 100 °C, the following reaction occurs.

$$CH_2ICH_2I \rightarrow CH_2{=}CH_2 + I_2$$

Experiment	Relative concentrations		Relative light intensity	Relative initial rate of formation of iodine
	CH_2ICH_2I	I_2		
1	4	1	4	2
2	4	1	1	1
3	2	1	4	1
4	2	2	4	1

From the data above, the rate of formation of iodine is

1 independent of the initial concentration of I_2

2 proportional to the initial concentration of CH_2ICH_2I

3 proportional to the square root of light intensity

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

33 Why is the addition of concentrated sulfuric acid to solid potassium iodide **unsuitable** for the preparation of hydrogen iodide?

1 Hydrogen iodide is not displaced by sulfuric acid

2 Iodide ions are oxidised to iodine

3 The product is contaminated by sulfur-containing compounds

34 When a paramagnetic object is placed in a strong magnetic field, it is attracted to the field. Paramagnetism is associated with unpaired electrons, and many transition elements are often paramagnetic because they contain unpaired d-electrons.

Which of the following transition metal atoms or ions would you expect to be paramagnetic?

1 Cr

2 Mn

3 Cu^{+}

35 The enthalpy changes of formation of carbon monoxide and carbon dioxide are given below.

$D\mathit{H}_f(CO) = -110\ kJ\ mol^{-1}$

$D\mathit{H}_f(CO_2) = -393\ kJ\ mol^{-1}$

Which of the following statements are correct?

1 The enthalpy change of combustion of carbon monoxide is exothermic.

2 Carbon dioxide is energetically more stable than carbon monoxide.

3 The enthalpy change of combustion of carbon is $-110\ kJ\ mol^{-1}$.

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

36 What are the conditions usually quoted for the standard electrode potential of hydrogen to be 0.00 V?

1 temperature is 25 °C

2 pH of the acid solution is 1.0

3 atmospheric pressure is exactly 1 atm

37 *Use of the Data Booklet is relevant to this question.*

When nitric acid is added to iron filings, a brown gas that turns moist blue litmus red is observed.

Which statements are correct?

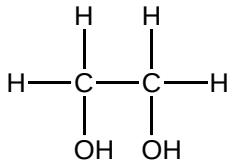
1 Iron acts as a reducing agent.

2 The standard cell potential of the reaction between iron filings and nitric acid is +0.04 V.

3 Addition of potassium cyanide to the reaction vessel of nitric acid and iron filings will result in a decrease in the standard cell potential.

38 By varying the conditions of the reaction between 1,2-dibromoethane and sodium hydroxide, which of the following compounds can be obtained?

1



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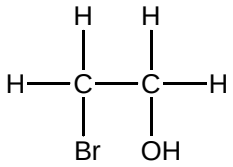

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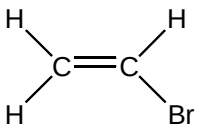

A	B	C	D
1, **2** and **3** are correct	**1** and **2** only are correct	**2** and **3** only are correct	**1** only is correct

39 Ethanal can react with HCN in a nucleophilic addition reaction catalysed by NaCN. Which of the following statements about the reaction mechanism are true?

1 The shape of the intermediate is planar.

2 In the intermediate, the oxygen carries a negative charge.

3 A new carbon-carbon bond is formed.

40 In which of the following reactions is the inorganic reagent acting as a nucleophile?

1 $CH_3CH_2Cl + KCN \rightarrow CH_3CH_2CN + KCl$

2 $CH_3COCl + NH_3 \rightarrow CH_3CONH_2 + HCl$

3 $CH_3CH_2NH_2 + HCl \rightarrow CH_3CH_2NH_3^+Cl^-$

− End of Paper 1 −