



RIVER VALLEY HIGH SCHOOL

YEAR 6 PRELIMINARY EXAMINATION

CANDIDATE
NAME

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CLASS

6	
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CENTRE
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INDEX
NUMBER

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H2 CHEMISTRY

9647/01

Paper 1 Multiple Choice

22 September 2011

1 hour

Additional Materials: Multiple Choice Answer Sheet
 Data Booklet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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.

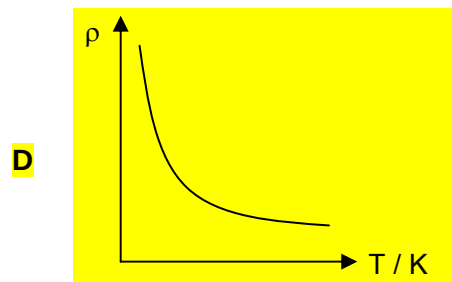
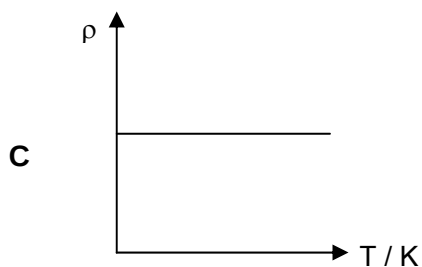
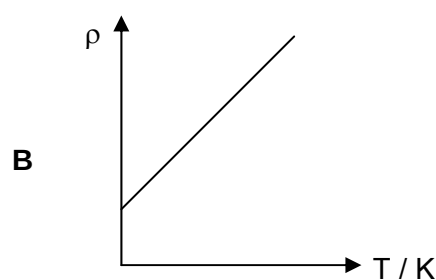
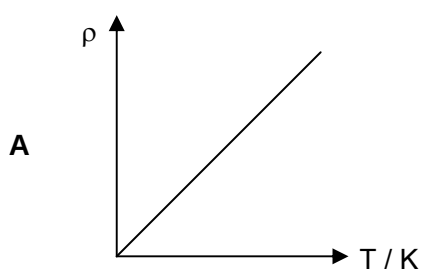
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

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.

- Complete combustion of a sample of a hydrocarbon, **Y**, gave 0.66 g of carbon dioxide and 0.36 g of water. The empirical formula of **Y** is
A C_3H_4 **B** C_3H_5 **C** C_3H_8 **D** C_6H_8
- 10 cm³ of 0.2 mol dm⁻³ K_2XO_4 will react with 40 cm³ of 0.1 mol dm⁻³ iron (II) sulfate solution. If Fe^{2+} is oxidised to Fe^{3+} by K_2XO_4 , what is the final oxidation state of **X**?
A +2 **B** +3 **C** +4 **D** +5
- Which one of the following ions has the most number of unpaired electrons?
A Cr^{3+} **B** Ni^{2+} **C** Ca^{2+} **D** Co^{3+}
- Which of the following species contains the smallest bond angle?
A N_2H_4 **B** BrF_5 **C** XeF_2 **D** SO_2
- Which of the following graphs shows the correct relationship between the density of a gas (ρ) against temperature (T) for an ideal gas under constant pressure?



6. Given the information:

$$\Delta H_c(\text{C}) = -394 \text{ kJ mol}^{-1}$$

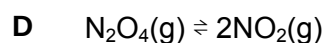
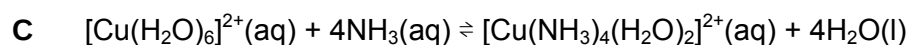
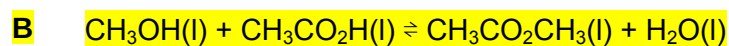
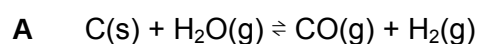
$$\Delta H_f(\text{H}_2\text{O}) = -286 \text{ kJ mol}^{-1}$$

$$\Delta H_f(\text{CH}_3\text{OH}) = -239 \text{ kJ mol}^{-1}$$

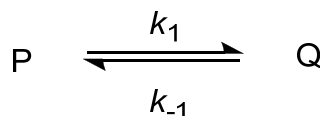
Which one of the following is the correct enthalpy change of combustion of methanol, CH_3OH , in kJ mol^{-1} ?

- A -441 **B -727** C -919 D -1205

7. For which equilibrium does K_c have no units?



8. A substance **P** changes to form the product **Q**, according to the equation



k_1 = rate constant of the forward reaction

k_{-1} = rate constant of the backward reaction

Both the forward and backward reactions are first order.

Which of the following expression represents the equilibrium constant, K_c ?

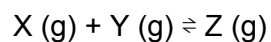
A k_1

C $\frac{k_1}{k_{-1}}$

B $k_1[\text{P}]$

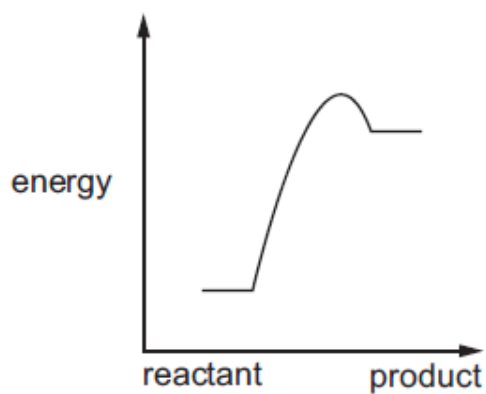
D $\frac{k_1[\text{P}]}{k_{-1}[\text{Q}]}$

9. Four reactions of the type shown are studied at the same temperature.

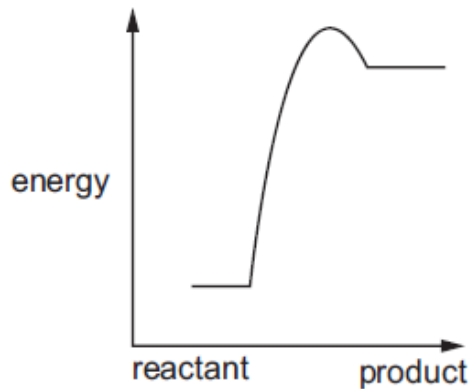


Which is the correct reaction pathway diagram for the reaction that would proceed most rapidly and with good yield?

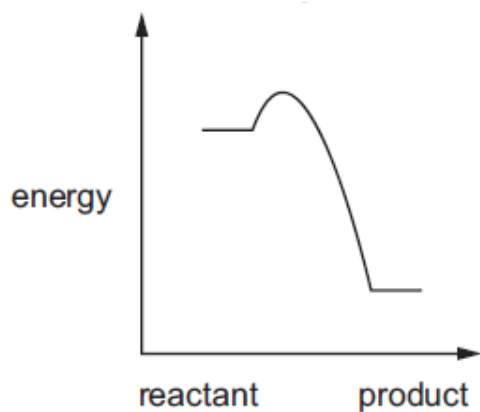
A



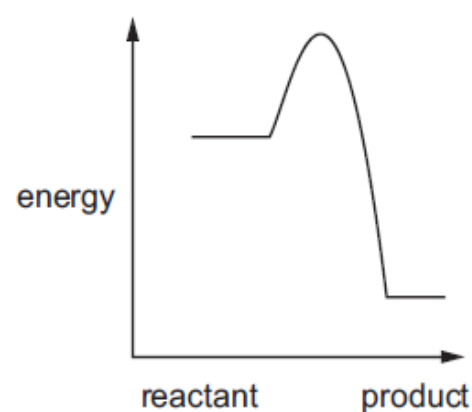
B



C



D



10. The solubility of barium hydroxide in water is least affected by the addition of

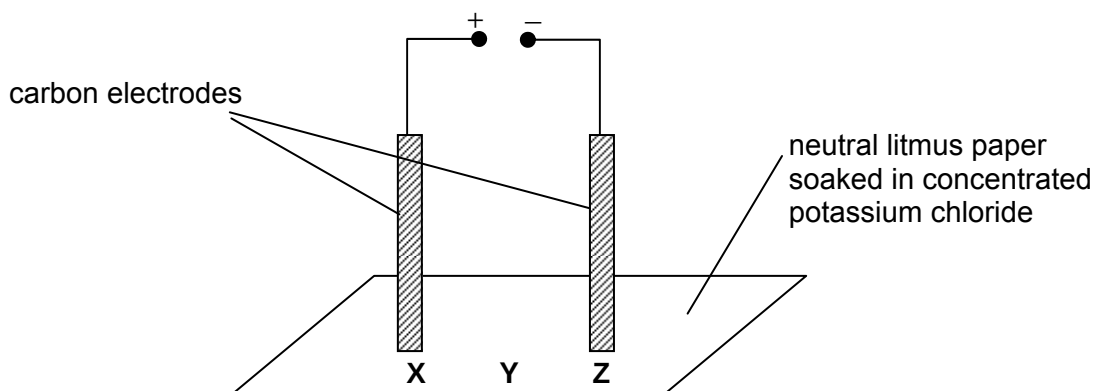
A $BaSO_4$

B Br_2

C NH_3

D CH_3COCl

11. A direct current is passed through the apparatus shown in the diagram below.



What are the colours at positions X, Y and Z?

- | | X | Y | Z |
|---|-------|--------|-------|
| A | red | purple | blue |
| B | blue | purple | red |
| C | white | purple | blue |
| D | blue | purple | white |
12. The use of *Data Booklet* is relevant to this question.
- In many areas, tap water becomes slightly acidic due to dissolved carbon dioxide.
- By considering the relevant E^θ values, which of the following metals will not be dissolved by tap water containing carbon dioxide?
- | | | | |
|---|----------|---|--------|
| A | chromium | B | copper |
| C | iron | D | lead |
13. Which of the following elements is expected to show the greatest tendency to form covalent compounds?
- | | |
|---|-----------|
| A | barium |
| B | calcium |
| C | magnesium |
| D | potassium |

14. Element Y is in Period 3. It forms an acidic oxide which is insoluble in water and a chloride which is readily hydrolysed by water.

Which group in the Periodic Table might contain Y?

- A II
- B III
- C IV**
- D V

15. Which of the following statements about Group VII compounds is correct?

- A The reducing power of the hydrogen halides increases down the group.**
- B The thermal stability of the hydrogen halides increases down the group.
- C The solubility of the silver halides increases down the group.
- D The magnitude of the lattice energy of the silver halides increases down the group.

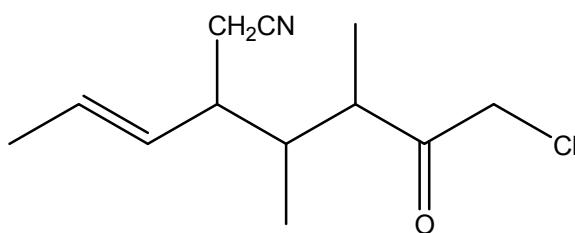
16. Which of the following transition elements can show the highest oxidation number in its compounds?

- A chromium
- B copper
- C iron
- D manganese**

17. A compound X was dissolved in water and then aqueous sodium hydroxide was added until present in excess. A white precipitate was formed, which turned brown on standing.

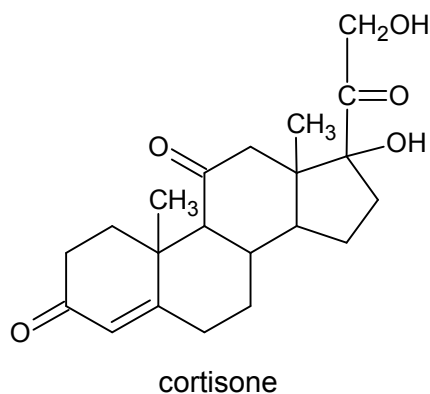
- | | | | |
|---|-------------------|----------|---|
| A | MgSO ₄ | B | MnSO₄ |
| C | FeSO ₄ | D | Fe ₂ (SO ₄) ₃ |

18. Which of the following options about the structure (as shown below) is correct?



	No of sp hybridised C	No of sp^2 hybridised C	No of sp^3 hybridised C
A	1	3	6
B	1	3	8
C	0	4	6
D	0	4	8

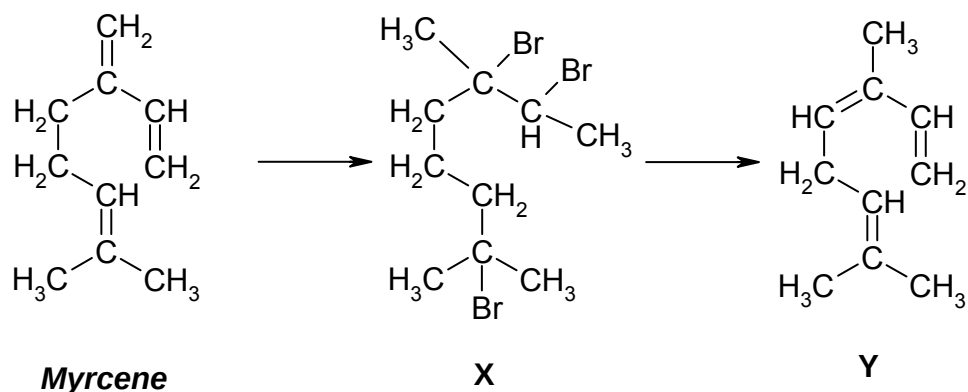
19. The drug cortisone has the formula shown.



How many chiral centres are present in the cortisone molecule?

- A 3 B 4 C 5 **D 6**
20. Which hydrocarbon can form a monochloro-substituted derivative which shows both optical and cis-trans isomerism?
- A $\text{CH}_3\text{CH}=\text{CH}_2$
 B $(\text{CH}_3)_2\text{C}=\text{CH}_2$
 C $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)_2$
D $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_3$

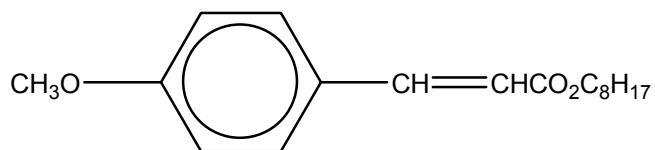
21. *Myrcene* is a chemical produced by pine trees in North America, which attracts females of the beetle *Dendroctonus brevicornis*. This will indirectly cause the death of the tree. To prevent this, *Myrcene* can be converted to its isomer, **Y**, via intermediate **X**.



Which of the following statements is true?

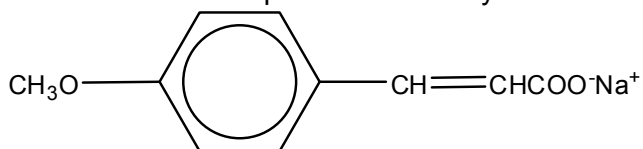
- A *Myrcene* reacts with 1.5 moles of bromine to form intermediate X.
- B *Myrcene* can be distinguished from its isomer Y by reaction with hot, acidified KMnO_4 .
- C Intermediate X reacts with ethanolic sodium hydroxide to form isomer Y.
- D X is formed from *Myrcene* via hydrogenation.
22. Which of the following is the least likely product formed in the termination step in the reaction of CH_3CH_3 with Cl_2 in the presence of UV light?
- A HCl
- B $\text{CH}_3\text{CH}_2\text{Cl}$
- C $\text{CH}_3\text{CH}_2\text{Cl}_2$
- D C_4H_{10}
23. Geraniol is found in rose oil and is used for the preparation of artificial scents. Upon controlled oxidation, geraniol yields CH_3COCH_3 , $\text{CH}_3\text{COCH}_2\text{CH}_2\text{COOH}$ and $\text{H}_2\text{C}_2\text{O}_4$. $\text{H}_2\text{C}_2\text{O}_4$ neutralises completely 2 moles equivalent of NaOH in an acid-base reaction, and can also be oxidised under vigorous conditions to CO_2 and H_2O . A possible structure of geraniol is:
- A $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{C}(\text{CH}_3)=\text{CHCH}_2\text{OH}$
- B $(\text{CH}_3)_2\text{C}=\text{CHCH}_2\text{CH}_2\text{C}(\text{CH}_3)=\text{CHCH}_2\text{OH}$
- C $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)\text{CH}_2\text{C}(\text{CH}_3)=\text{CHCH}_2\text{OH}$
- D $(\text{CH}_3)_2\text{C}=\text{CHCH}_2\text{CH}_2\text{C}(\text{CH}_2\text{OH})=\text{CHCH}_3$

24. The compound 2-ethylhexyl-p-methoxycinnamate (MOC) is used as a sunscreen.



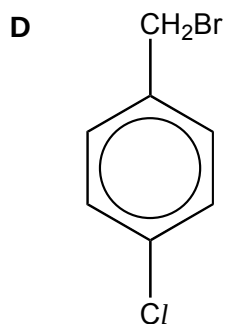
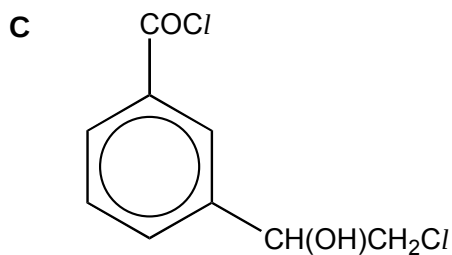
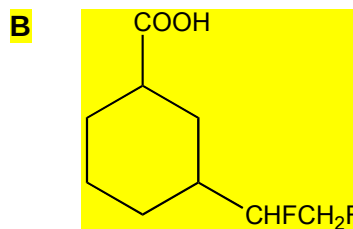
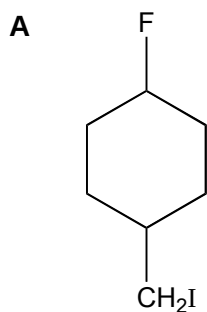
Which of the following statement regarding this compound is correct?

- A It is slightly soluble in water.
- B A brown precipitate is formed with cold alkaline KMnO_4 .**
- C It reacts with cold aqueous NaOH to yield

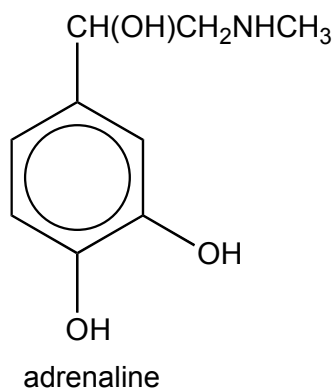


- D A racemic mixture is produced when it is boiled with aqueous hydrochloric acid.

25. Which of the following compounds will **not** give a precipitate when boiled with aqueous silver nitrate?

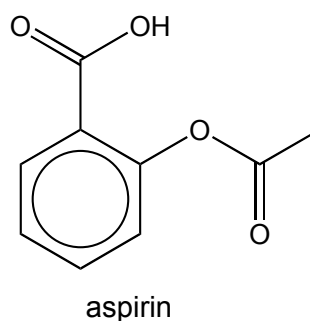
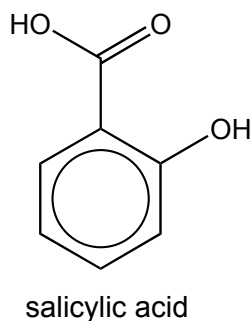


26. Adrenaline is the hormone responsible for an increased heart rate when an individual receives a shock.



Which of the follow statements about adrenaline is **incorrect**?

- A It decolourises a hot solution of KMnO_4 .
 - B It gives a salt with both acids and bases.
 - C It reacts with neutral $\text{FeCl}_3(\text{aq})$ to produce a violet colouration.
 - D It reacts with SOCl_2 to produce a tri-chlorinated compound.**
27. Salicylic acid and aspirin are both used to reduce fever and pain.



Which of the following reagents can be used to distinguish between liquid samples of salicylic acid and aspirin?

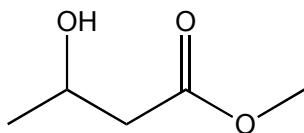
- A Hot, alkaline I_2
- B Aqueous Na_2CO_3
- C Aqueous bromine**
- D Hot, acidified KMnO_4

28. Organic compound **P** has the following properties:

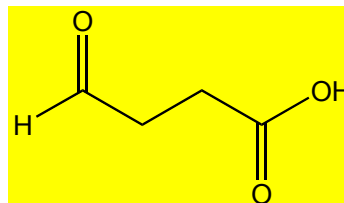
- Produces white fumes with PCl_5
- Forms a brick-red precipitate with Fehling's reagent

Which of the following compounds could be **P**?

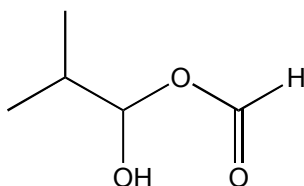
A



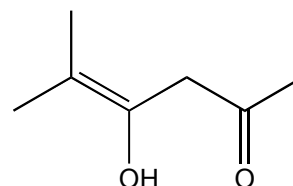
B



C



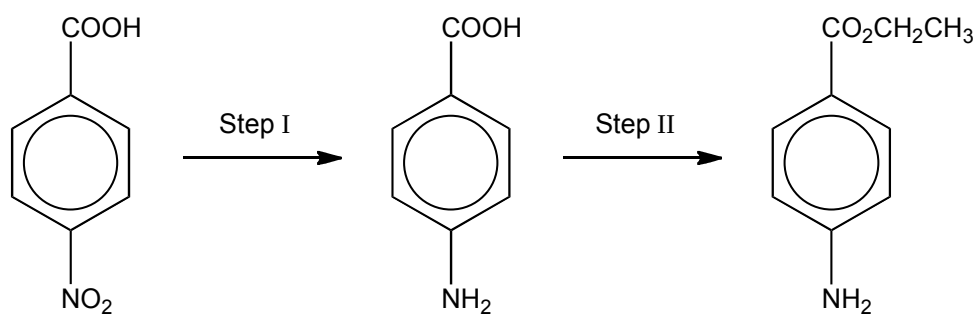
D



29. Which one of the following statements regarding organic reaction mechanisms is **incorrect**?

- A Electrophilic addition of alkenes involves a carbocation intermediate.
- B Electrophilic substitution of benzene involves an intermediate with 4 π electrons.
- C Nucleophilic substitution of primary halogenoalkanes will not give a racemic mixture.
- D Nucleophilic addition of a carbonyl compound involves an intermediate with a sp^2 carbon.

30. Benzocaine, a local anaesthetic, can be synthesised from 4-nitrobenzoic acid in two steps:



Which of the following shows the correct reagents and conditions for Steps I and II?

	Step I	Step II
A	LiAlH_4 in dry ether	CH_3COCl
B	LiAlH_4 in dry ether	$\text{CH}_3\text{CH}_2\text{OH}$, conc. H_2SO_4 , heat under reflux
C	Sn , conc. HCl , warm, followed by NaOH(aq)	CH_3COCl
D	Sn , conc. HCl , warm, followed by NaOH(aq)	$\text{CH}_3\text{CH}_2\text{OH}$, conc. H_2SO_4 , heat under reflux

Section B

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

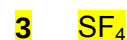
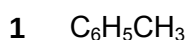
Decide whether each of the statements is or is not correct.

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

No other combination of statements is used as a correct response.

31. Which of the molecules are polar?



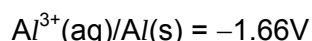
32. The magnitude of the enthalpy change of hydration, ΔH_{hyd} , for some halide ions are listed in the table below.

Halide ion	Cl^-	Br^-	I^-
Magnitude of ΔH_{hyd} / kJ mol^{-1}	381	350	307

Which of the following properties explain the trend shown in this data?

- 1 The ionic radius of the halide ion
- 2 The proton number of the halide ion
- 3 The electron affinity of the halogen atom

33. Pain is often felt when a piece of aluminium foil touches a dental amalgam filling in a tooth because an electric current momentarily flows. The amalgam contains tin. The standard electrode potentials are as follows.



Which of the following are features of the cell obtained?

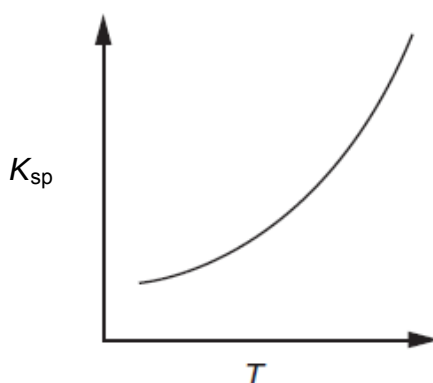
- 1 The aluminium foil acts as the negative electrode.
- 2 Sn^{2+} ions are momentarily discharged into the saliva in the mouth.
- 3 The e.m.f. of the cell is +1.79V.

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

No other combination of statements is used as a correct response.

34. XY_2 and ZY are sparingly soluble salts containing Z^+ , X^{2+} and Y^- ions.

The solubility product for the reaction K_{sp} of the sparingly soluble salt XY_2 varies with temperature as shown in the diagram below.



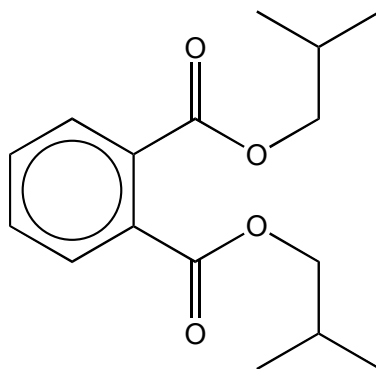
Which conclusions can be drawn from these information?

- 1 The reaction is endothermic in the forward direction.
 - 2 Adding Y^- to the solution of XY_2 decreases the K_{sp} of XY_2 .
 - 3 Given two solutions with $[X^{2+}] = [Z^+]$, higher concentration of Y^- is required to precipitate X^{2+} compared to Z^+ .
35. Which statements about the properties of a catalyst are correct?
- 1 A catalyst increases the average kinetic energy of the reacting particles.
 - 2 A catalyst increases the rate of the reverse reaction.
 - 3 A catalyst has no effect on the enthalpy change ΔH .
36. The Group II metals have higher melting points than the Group I metals.
Which factors could contribute towards the higher melting points?
- 1 There are smaller interatomic distances in the metallic lattices of the Group II metals.
 - 2 Two valence electrons are available from each Group II metal atom for bonding the atom into the metallic lattice.
 - 3 Group II metals have the higher first ionisation energy.

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

No other combination of statements is used as a correct response.

37. In June 2011, a variety of Taiwanese food products were found to contain diisobutyl phthalate (DIBP), a plasticiser.



Diisobutyl phthalate (DIBP)

Which of the following statements about DIBP are **incorrect**?

- 1 DIBP produces a pale yellow precipitate when heated with alkaline aqueous iodine.
 - 2 When DIBP is heated with acidified potassium manganate(VII), the purple solution decolourises.
 - 3 When DIBP is heated with dilute sulfuric acid, one of the products requires two molar equivalents of aqueous sodium hydroxide for complete neutralisation.
38. Deuterium, D, is the ${}^2_1\text{H}$ isotope of hydrogen.

Which of the following reactions yield a carbon compound containing deuterium?

- 1 $\text{CH}_2=\text{CH}_2 \xrightarrow{\text{DCI}}$
- 2 $\text{CH}_3\text{CN} \xrightarrow[\text{D}_2\text{O}]{\text{D}_2\text{SO}_4, \text{heat}}$
- 3 $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{I}_2, \text{NaOD, heat}}$

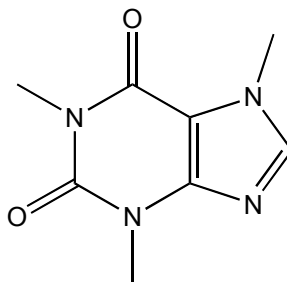
A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

No other combination of statements is used as a correct response.

39. Which of the following could result in the loss of the secondary structure of a protein?

- 1 Heating
- 2 Addition of ethanol
- 3 Addition of aqueous acid

40. When students revise late into the night, they tend to drink coffee to keep themselves awake. Caffeine is the stimulant found in coffee.



caffeine

Which of the following statements about caffeine are correct?

- 1 Caffeine will form an orange-yellow precipitate with 2,4-DNPH.
- 2 Caffeine has carbon atoms with bond angles of both 109.5° and 120° .
- 3 A fishy smell is detected when caffeine is heated with aqueous sodium hydroxide.