INNOVA JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION
in preparation for General Certificate of Education Advanced Level
Higher 1

CANDIDATE NAME			
CLASS		INDEX NUMBER	

CHEMISTRY 8872/01

Paper 1 Multiple Choice **30 August 2016**

50 minutes

Additional Materials: Data Booklet
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **thirty** 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.

Section A

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

1 The relative atomic mass of an element is defined as

A $\dfrac{\text{average mass of one atom of carbon-12}}{\text{mass of one atom of carbon-12}}$

B $\dfrac{\text{average mass of one atom of the element}}{\text{mass of one atom of carbon-12}}$

C $\dfrac{\frac{1}{12} \text{ x average mass of one atom of carbon-12}}{\text{average mass of one atom of the element}}$

D $\dfrac{\text{average mass of one atom of the element}}{\frac{1}{12} \text{ x average mass of one atom of carbon-12}}$

Solution:

Relative Atomic Mass, A_r is defined as the ratio of the weighted average mass of one atom of the element to $\frac{1}{12}$ of the mass of an atom of ^{12}C

Ans: D

2 On combustion, CS_2 is oxidised as follows.

$$CS_2(g) + 3O_2(g) \longrightarrow CO_2(g) + 2SO_2(g)$$

A 20 cm^3 sample of carbon disulfide vapour is ignited with 100 cm^3 of oxygen. The final volume of gas after burning is treated with an excess of aqueous alkali. [All volumes were measured at the same temperature and pressure, conditions under which CS_2 is a gas.]

What percentage of this final volume dissolves in the alkali?

A 20% **B** 40% **C** 60% **D** 80%

Solution:

	$CS_2(g)$	+	$3O_2(g)$	→	$CO_2(g)$	+	$2SO_2(g)$
Initial Vol/ cm^3	20		100		–		–
Change in Vol / cm^3	−20		−60		+20		+40
Final Vol / cm^3	–		40		20		40

Total volume of gases at the end of reaction = 40 + 20 + 40 = 100 cm^3

Both CO_2 and SO_2 are **acidic gases** which will react with NaOH

Hence % of final volume dissolved in alkali 60/100 x 100% = 60%
Ans: **C**

3 An oxidising agent, $\mathbf{X}O_4^-$, in the presence of excess alkali oxidised sulfur dioxide gas to sulfate(VI) ions, SO_4^{2-} at room temperature and pressure. $\mathbf{X}O_4^-$ is reduced to $\mathbf{X}^{2+}$ in the process.

What changes in oxidation state occur for S and **X** in this reaction?

	Change in oxidation state	
	S	X
A	+2	– 5
B	+4	–7
C	+2	–7
D	+6	–2

Solution:

From Data Booklet,

$SO_2 + 2H_2O \rightarrow SO_4^{2-} + 4H^+ + 2e^-$

(+4) (+6)

Change in oxidation of S = +6 – (+4) = **+2**

$\mathbf{X}O_4^- + 8H^+ + 5e^- \rightarrow \mathbf{X}^{2+} + 4H_2O$

(+7) (+2)

Change in oxidation of **X** = +2 – (+7) = **−5**

Ans: **A**

4 Which of the following species has more protons than electrons and more protons than neutrons? [H = ^{1}H, D = ^{2}H, O = ^{16}O]

A H_2O **B** H_3O^+

C D_2O **D** D_3O^+

Solution:

A H_2O
(10 protons + 10 electrons + 8 neutrons)

B H_3O^+
(11 protons + 10 electrons + 8 neutrons)

C D_2O
(10 protons + 10 electrons + 10 neutrons)

D D_3O^+
(11 protons + 10 electrons + 11 neutrons)

Ans: **B**

5 The electronic configurations of four elements are given.

Which of these elements has the highest first IE?

A $1s^2 2s^2 2p^3$

B $1s^2 2s^2 2p^4$

C $1s^2 2s^2 2p^6 3s^1$

D $1s^2 2s^2 2p^6 3s^2 3p^1$

Solution:

Using Data Booklet,

A is N (1^{st} IE = 1400 kJ mol^{-1}) **B** is O (1^{st} IE = 1310 kJ mol^{-1})

C is Na (1^{st} IE = 494 kJ mol^{-1}) **D** is Al (1^{st} IE = 577 kJ mol^{-1})

OR

C and **D** has 1 more principle quantum shell compared to **A** and **B**. As a result, valence electrons in **C** and **D** is further away and less strongly attracted to the nucleus. Hence, it has lower IE than **A** and **B**.

Between **A** and **B**, there is inter-electronic repulsion between the paired electrons in the same 2p orbital of **B**, resulting in less energy required to remove the valence electron. Hence, **A** has the highest IE.

Ans:**A**

6 Which molecule contains six bonding electrons?

A C_2H_4 **C** H_2S

B CO_2 **D** NCl_3

Answer: D

C_2H_4 – 12 bonding electrons
CO_2 – 8 bonding electrons
H_2S – 4 bonding electrons
NCl_3 – 6 bonding electrons

7 In which of the following pairs of compounds would the melting point of compound **I** be higher than compound **II**?

	Compound **I**	Compound **II**
A	KC*l*	NaC*l*
B	A*l*F_3	A*l*Cl_3
C	NH_3	H_2O
D	SiCl_4	SiO_2

Answer: B

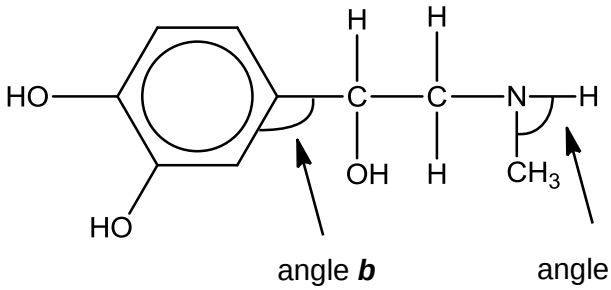
A: KCl < NaCl Na^+ has smaller ionic radius, results in higher lattice energy

B: AlF_3 is giant ionic structure and $AlCl_3$ is simple molecular structure

C: NH_3 < H_2O water can form average of 2 intermolecular hydrogen bonding

D: $SiCl_4$ is simple molecular structure and SiO_2 is giant covalent structure

8 Adrenaline is a hormone which, when secreted directly into the blood stream, acts as a stimulant. It has the following structure:



What are the values of angle ***b*** and angle ***d*** in a molecule of adrenaline?

	angle ***b***	angle ***d***
A	120	107
B	120	90
C	109	107
D	109	90

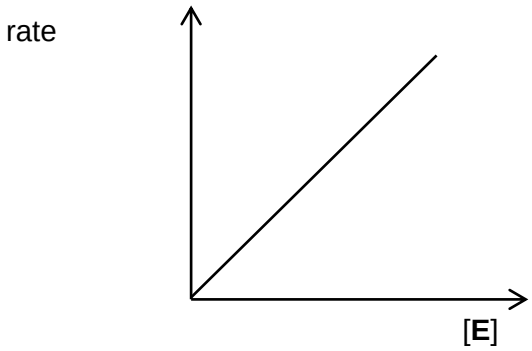
Answer:A
b: 3 bond pairs + 0 lone pairs – 120°
d: 3 bond pairs + 1 lone pair – 107°

9 The following reaction is first order with respect to **E** and zero order with respect to **F**.

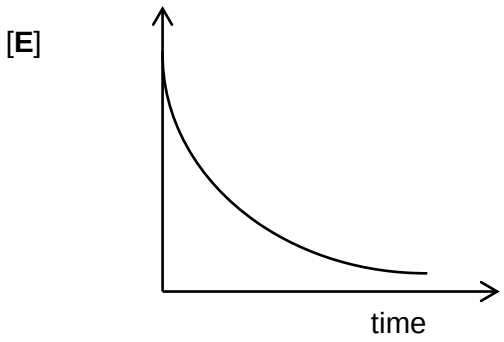
$$\mathbf{E} + \mathbf{F} \longrightarrow \mathbf{G}$$

Which of the following graph obtained is **incorrect**?

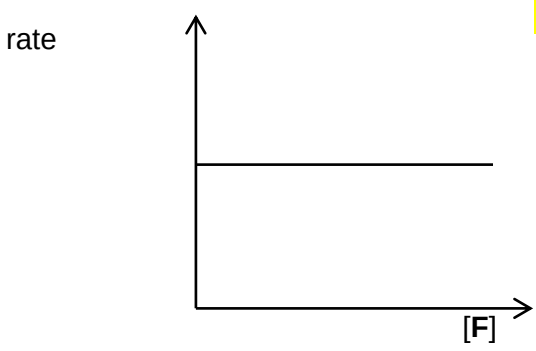
A



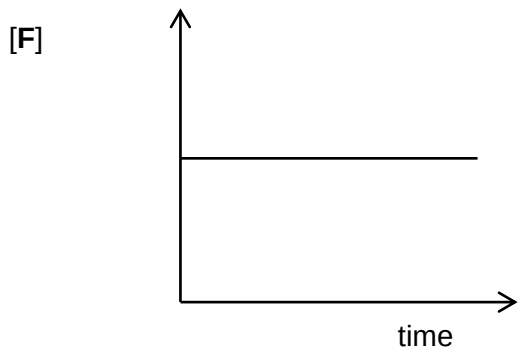
C



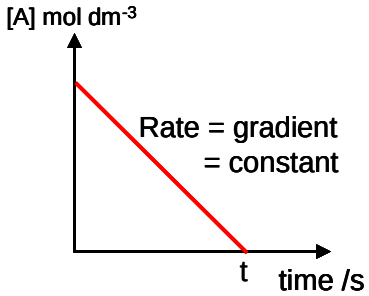
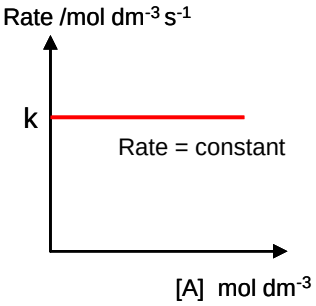
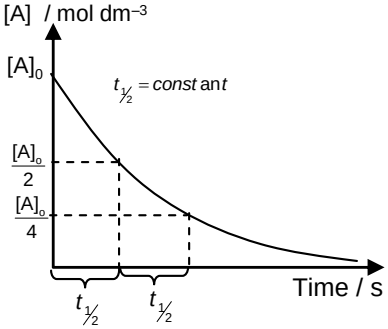
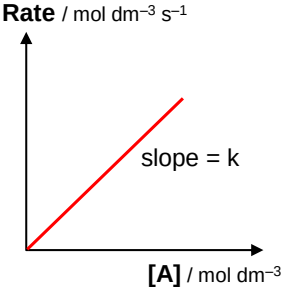
B



D



Answer:D

	Graph of [A] vs time	**Graph of Rate vs [A]**
Zero order reaction		
First order reaction		

10 Lead is the final product formed by a series of changes in which the slowest step is the radioactive decay of uranium-238. This radioactive decay is a **first order** reaction with half-life of 4.50×10^9 year.

What would be the age of a rock sample, originally lead-free, in which the molar proportion of uranium to lead is now 1:15?

A 2.25×10^9 years

B 9.00×10^9 years

C 1.35×10^{10} years

D 1.80×10^{10} years

Answer: D

uranium : lead
100% : 0%
↓
50% : 50% (1:1)
↓
25% : 75% (1:3)
↓
12.5% : 87.5% (1:7)
↓
6.25% : 93.75% (1:15)

Time taken = $4 \times t_{1/2} = 4 \times 4.50 \times 10^9 =$ **1.80×10^{10} years**

11 When 0.1 mol of bismuth chloride is added to 1 dm^3 of water, it reacts to form 0.02 mol of white precipitate of bismuth oxychloride and a solution of hydrochloric acid.

The equation for the reaction is as follows.

$$BiCl_3(aq) + H_2O(l) \rightleftharpoons BiOCl(s) + 2HCl(aq)$$

What is the correct expression for the equilibrium constant K_c?

A $\dfrac{(2 \times 0.02)^2}{0.08}$

B $\dfrac{(0.02)(2 \times 0.02)^2}{0.08}$

C $\dfrac{0.08}{(2 \times 0.02)^2}$

D $\dfrac{0.08}{(0.02)(2 \times 0.02)^2}$

Answer: A

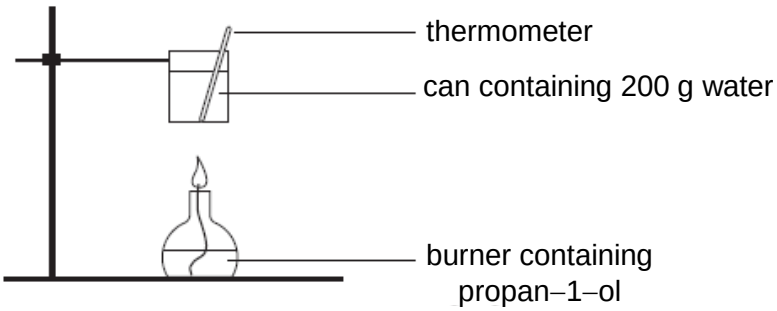
Concentrations of pure solids and pure liquids (in the heterogeneous equilibrium) do not appear in the K_c expression. They are assumed to be constant at a given temperature, as they do not change significantly during the course of reaction.

$$K_c = \frac{[HCl]^2}{[BiCl_3]}$$

	$BiCl_3(aq)$ +	$H_2O(l)$ ⇌	$BiOCl(s)$ +	$2HCl(aq)$
Initial amount / mol	0.1		0	0
Change in amount/ mol	- 0.02		+2 x 0.02	+2 x 0.02
Equilibrium amount / mol	0.08		0.02	2 x 0.02
Concentration at equilibrium / mol dm^{-3}	$\frac{0.08}{1}$			$\frac{2 \times 0.02}{1}$

$$K_c = \frac{(2 \times 0.0\ 2)^2}{(0.08)}$$

12 A student used the apparatus below to determine the standard enthalpy change of combustion of propan–1–ol, $CH_3CH_2CH_2OH$ (M_r = 60.0).



The following results were obtained:

Mass of propan-1-ol burnt = 0.60 g
Mass of water heated = 200 g
Initial temperature of water = 21.0 °C

The specific heat capacity of water is 4.18 J g^{-1} K^{-1}.
The standard enthalpy change of combustion of propan–1–ol is –2021 kJ mol^{-1}.

Assuming no heat loss, what would be the maximum temperature of the water?

A 24.2 °C **B** 29.1 °C **C** 45.2 °C **D** 48.4 °C

Answer: C

amount of butane gas = $\frac{0.60}{60.0}$ = 0.01 mol

Heat released by combustion of butane = 2021 x 0.01 = 20.21 kJ = 20210 J

Temperature change = $\frac{Q}{mc} = \frac{20210}{(200)(4.18)}$ = 24.2 °C

Maximum temperature of the water = 21 + 24.2 = 45.2 °C

13 Tetrachloroethene is commonly used as degreasing solvent. The enthalpy change for the following reaction is –878.5 kJ mol^{-1}.

$$C_2H_4(g) + 4HCl(g) + 2O_2(g) \rightarrow C_2Cl_4(l) + 4H_2O(l)$$

$\Delta H_f [C_2H_4(g)]$ = +52.3 kJ mol^{-1}
$\Delta H_f [HCl(g)]$ = –92.3 kJ mol^{-1}
$\Delta H_f [H_2O(l)]$ = –285.8 kJ mol^{-1}

Which of the following is the enthalpy change of formation of tetrachloroethene given the information above?

A –52.2 kJ mol^{-1}

B –63.3 kJ mol^{-1}

C –325.8 kJ mol^{-1}

D –632.7 kJ mol^{-1}

Answer: A

$$\Delta H_f^{\theta} = \sum m\,(\Delta H_f \text{ of products}) - \sum n\,(\Delta H_f \text{ of products})$$

$$-878.5 = [\Delta H_f [C_2Cl_4(l)] + 4(-285.8)] - [4(-92.3) + 52.3)]$$

$[\Delta H_f [C_2Cl_4(l)] = -52.2$ kJ mol^{-1}

14 Water dissociates as follows: $H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$. At a certain temperature above 298 K, the K_w of water is 1.0 x 10^{-13} mol^2 dm^{-6}.

Which of the following deduction can be made from these information?

A The total concentration of ions in the equilibrium mixture is 6.32 x 10^{-7} mol dm^{-3}.

B The water is acidic at this temperature.

C The K_w of water is defined as $[H^+][OH^-] / [H_2O]$.

D The dissociation of water is exothermic.

Answer: A

Option A is correct.

$K_w = [H^+][OH^-]$

$1.0 \times 10^{-13} = [H^+]^2$

$[H^+] = \sqrt{1.0 \times 10^{-13}}$

$[H^+] = 3.16 \times 10^{-7}$ mol dm^{-3}

$[H^+] + [OH^-] = 3.16 \times 10^{-7} \times 2 = 6.32 \times 10^{-7}$ mol dm^{-3}

Option B is incorrect.

Water is neutral at this temperature as $[H^+] = [OH^-]$.

Option C is incorrect.

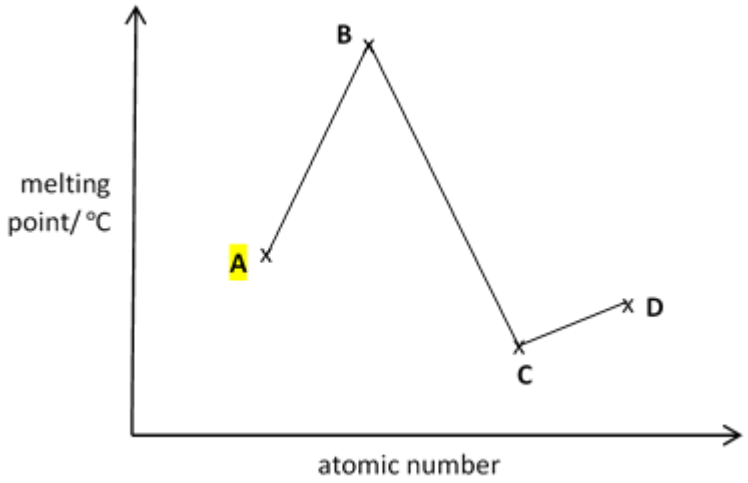
K_w of water is defined as $K_w = [H^+][OH^-]$

Option D is incorrect.

At a certain temperature above 298 K, the K_w of water increases from 1.0×10^{-14} mol^2 dm^{-6} to 1.0×10^{-13} mol^2 dm^{-6}. This shows that $[H^+]$ & $[OH^-]$ increases. This indicates that equilibrium position of $H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$ shifts to the right when temperature increases. The forward reaction (dissociation of water) is endothermic.

15 The graph shows the melting points of four consecutive elements in Period 3, Na to Ar, of the Periodic Table.

Which element is a good conductor of electricity?



Answer: **A**

Across Period 3, melting point increases from Na to Si (due to strong metallic bonds between cations and sea of delocalised electrons in giant metallic structures of Na, Mg and Al, and strong covalent bonds between atoms in giant covalent structure of Si) and decrease drastically from P to Ar (due to weak van der Waals' forces of attraction between the molecules in simple covalent structures of P, S, Cl and between the atoms in Ar)

Hence, **B** corresponds to Si and **A** corresponds to Al. Al is a good conductor of electricity.

16 What is formed when solid sodium chloride is added to water?

A sodium chloride molecules in solution

B sodium hydroxide solution and hydrochloric acid solution

C sodium hydroxide solution and hydrogen chloride gas

D sodium ions in solution and chloride ions in solution

Ans: D.
Recall: NaCl undergoes hydration in water to form Na^+ and Cl^- ions.
$NaCl + aq \rightarrow Na^+(aq) + Cl^-(aq)$

17 Compound **T**, $CH_2=CHCH_2COCH_2COOH$, was treated with 2 reducing agents in separate experiments.

Which row correctly shows the product formed when compound **T** is treated with the given reducing agent?

	reducing agent	product
A	H_2 + Ni	$CH_3CH_2CH_2CH(OH)CH_2CH_2OH$
B	H_2 + Ni	$CH_2=CHCH_2CH(OH)CH_2COOH$
C	$NaBH_4$	$CH_2=CHCH_2CH(OH)CH_2COOH$
D	$NaBH_4$	$CH_3CH_2CH_2COCH_2COOH$

Ans: C

Recall use of Reducing Agents:
H_2, Ni can reduce C=C bonds, carbonyl groups, but not carboxylic acids
$NaBH_4$ can reduce carbonyl groups, but not C=C bonds and carboxylic acids

18 Which of the syntheses will produce 2-methylpropanoic acid, $(CH_3)_2CHCOOH$?

A $CH_3CH(OH)CH_3 \xrightarrow[\text{heat}]{Cr_2O_7^{2-}/H^+} \mathbf{X} \xrightarrow[\text{cold}]{HCN/OH^-} (CH_3)_2CHCOOH$

B $CH_3CH(Br)CH_3 \xrightarrow[\text{heat}]{KCN(alc.)} \mathbf{X} \xrightarrow[\text{heat}]{H_2O/H^+} (CH_3)_2CHCOOH$

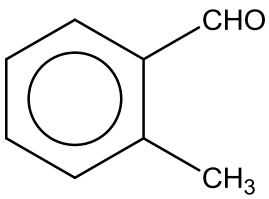
C $(CH_3)_2C{=}CH_2 \xrightarrow[\text{cold}]{MnO_4^-/H^+} \mathbf{X} \xrightarrow[\text{heat}]{Cr_2O_7^{2-}/H^+} (CH_3)_2CHCOOH$

D $(CH_3)_2CHCH_2Br \xrightarrow[\text{heat}]{KCN(alc.)} \mathbf{X} \xrightarrow[\text{heat}]{H_2O/H^+} (CH_3)_2CHCOOH$

Answer: **B**

Option A: $CH_3CH(OH)CH_3$ → CH_3COCH_3 → $CH_3C(OH)(CN)CH_3$
Option B: $CH_3CH(Br)CH_3$ → $CH_3CH(CN)CH_3$ → $CH_3CH(COOH)CH_3$
Option C: $(CH_3)_2C{=}CH_2$ → $C(CH_3)_2(OH)CH_2OH$ → $C(CH_3)_2(OH)COOH$
Option D: $(CH_3)_2CHCH_2Br$ → $(CH_3)_2CHCH_2CN$ → $(CH_3)_2CHCH_2COOH$

19 Compound **Q** has the following structure.



Compound **Q**

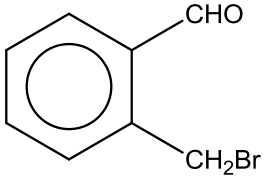
Which statement about compound **Q** is correct?

A Compound **Q** produces effervescence with sodium metal.

B Compound **Q** can be distinguished from ethanal by using Tollens' reagent.

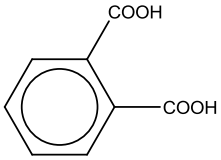
C On heating compound **Q** under reflux with an acidified solution of manganate(VII) ions, the empirical formula of the product formed is $C_4H_3O_2$.

D On heating compound **Q** with Br_2 in the presence of a suitable catalyst in the dark,



is obtained as the main product.

Ans: C

Option A: There is no -OH group, hence there is no reaction with Na
Option B: Q is an aromatic aldehyde which can also react with Tollens' reagent
Option C: 

is formed, which has a molecular formula $C_8H_6O_4$ and empirical formula $C_4H_3O_2$
Option D: No side-chain substitution should occur since reaction is carried out in the dark

20 In which class of compound, in its general formula, is the ratio of hydrogen atoms to carbon atoms the highest?

A alcohols

B aldehydes

C carboxylic acids

D halogenoalkanes

Answer: A

Compare CH_3CH_2OH vs CH_3CHO vs CH_3COOH vs CH_3CH_2Cl

H:C = 6:2 vs 4:2 vs 4:2 vs 5:2

21 Consider the following four compounds.

1 CH_2FCH_2COOH
2 $CH_3CHFCOOH$
3 CH_3CH_2COOH
4 CH_3CHFCH_2OH

What is the order of decreasing acidity of these compounds?

A 1 → 2 → 3 → 4

B 2 → 1 → 3 → 4

C 4 → 3 → 1 → 2

D 3 → 4 → 1 → 2

Answer: B

Acidity to compare with stability of anion

$CH_3CHFCOOH$ (F is electron withdrawing)

CH_2FCH_2COOH(F is further away by 1 C)

CH_3CH_2COOH

CH_3CHFCH_2OH (alcohol less acidic than carboxylic acid)

22 The table shows the result of separate tests done on compound **J**.

reagent	result
2,4-DNPH	positive
aq. I_2 in NaOH	positive
Tollens' reagent	negative

From the results of the above tests, what could compound **J** be?

A $CH_3CH(OH)COOH$

B CH_3COCH_2CHO

C $CH_3COOCH_2CH_3$

D $CH_3COCH(OH)CH_3$

Solution: D

Identify the functional groups present for each of the test result:

reagent	result	Functional group present
2,4-DNPH	positive	Ketone or aldehyde
aq. I_2 in NaOH	positive	$RCOCH_3$ or $RCH(OH)CH_3$
Tollens' reagent	negative	Aromatic and aliphatic aldehyde

Only compound D contains functional groups that satisfy the test results.

23 Halogenoalkane **K** reacts with ethanolic sodium hydroxide to produce an alkene that has geometric isomer.

Which of the following compounds is **K**?

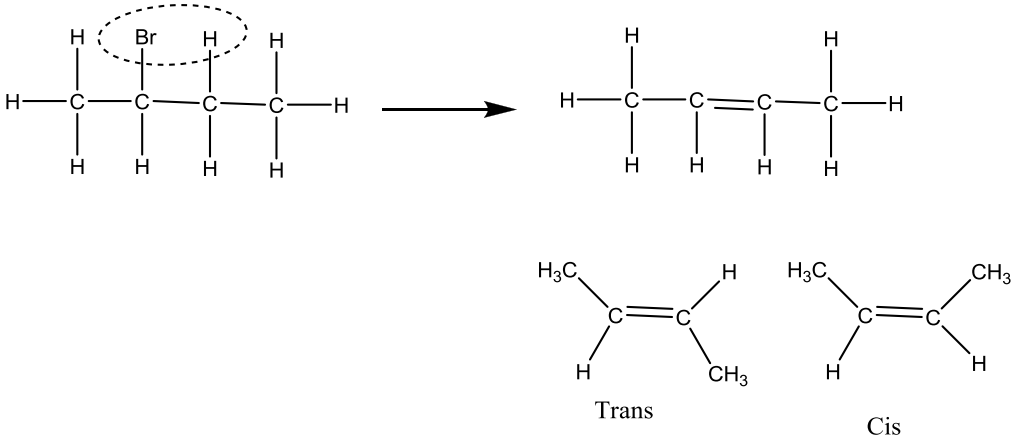
A 1-bromobutane

B 1-bromopropane

C 2-bromobutane

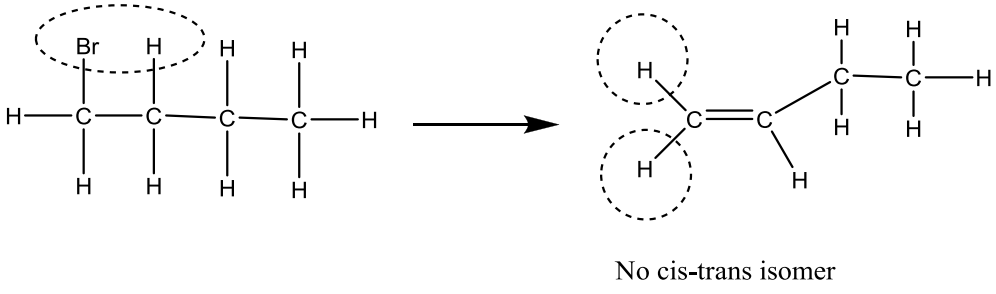
D 2-bromopropane

Solution: C

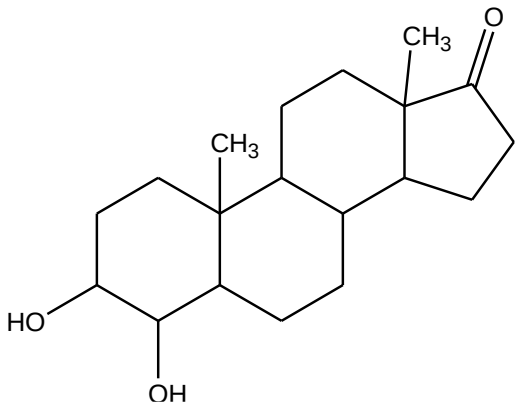


The rest of the options do not have different groups attached to the same carbon atom across the double bond:

i.e. 1-bromobutane



24 The steroid shown is an intermediate compound obtained during the synthesis of *Formestane* which is used in the treatment of breast cancer.



Which statement about this compound is correct?

A It will react with Fehling's solution.

B It will decolourise cold, dilute MnO_4^- ions.

C It will react with hydrogen cyanide in an addition reaction.

D It will decolourise aqueous bromine.

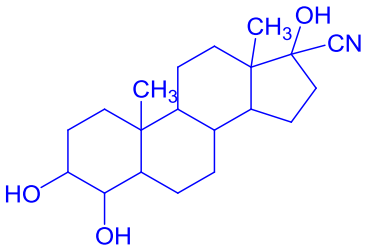
Solution:

Functional groups present in the molecule: ketone, secondary alcohol

A - Fehling's solution reacts with aliphatic aldehydes. Hence, no reaction.

B – No alkene group present for mild oxidation with cold, dilute MnO_4^- ions.

C – HCN reacts with the ketone functional group present via addition reaction to form the following compound:



D – No alkene functional group present. Hence, no addition reaction with aq. Br_2.

Ans: **C**

25 An ester L was refluxed with aqueous sodium hydroxide and the resulting mixture then distilled.

The distillate gave a positive tri-iodomethane test. The residue in the distillation flask, after acidification, gave a white precipitate.

What could be **L**?

A $CH_3CO_2C_6H_5$

B $CH_3OCOC_6H_5$

C $CH_3CH_2CO_2C_6H_5$

D $CH_3CH_2OCOC_6H_5$

Solution:

Thinking process:

- **L** undergoes alkaline hydrolysis with aq. NaOH to form an alcohol and carboxylate ion which on acidification, forms carboxylic acid.
- Distillate gave positive tri-iodomethane test ➔ mild oxidation occurs.
  Presence of R-CH(OH)CH_3 group.

Products of alkaline hydrolysis, followed by acidification:

A – Carboxylic acid: CH_3COOH (**no** white ppt) ,
Alcohol: C_6H_5OH (**no** yellow ppt with tri-iodomethane test)

B – Carboxylic acid: C_6H_5COOH (white ppt of benzoic acid)
Alcohol: CH_3OH (**no** yellow ppt with tri-iodomethane test),

C – Carboxylic acid: CH_3CH_2COOH (**no** white ppt of benzoic acid)
Alcohol: C_6H_5OH (**no** yellow ppt with tri-iodomethane test)

D – Carboxylic acid: C_6H_5COOH (white ppt of benzoic acid)
Alcohol: CH_3CH_2OH (yellow ppt with tri-iodomethane test)

Ans: **D**

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

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

26 Which property of ammonia can be explained in terms of hydrogen bonding?

1 It is very soluble in water.

2 Liquid ammonia contains ion NH_4^+ and NH_2^-.

3 It is a proton acceptor.

Answer : D

Statement 1(correct): Ammonia form strong intermolecular hydrogen bonding with H_2O hence very soluble.
Statement 2 and 3 involves proton transfer.

27 The working range and colour change of Bromocresol green is given below.

indicator	working pH range	colour change	
		acid	alkali
Bromocresol green	3.8 – 5.4	yellow	blue

Two drops of this indicator are added to each of the three aqueous solutions listed below.

Which solution has its colour correctly stated?

	solution	colour
1	Aluminium oxide added to water	blue
2	Dilute HC*l* of concentration 3.0 x 10^{-5} mol dm^{-3}	green
3	Aqueous solution of $MgCl_2$	yellow

Answer: B

Option 1 is correct.
Aluminium oxide does not dissolve in water and it gives a pH 7 solution. According to the working pH range of this indicator, the color is blue.

Option 2 is correct.
$\therefore$ pH = - $\log_{10}$ (3.0×10^{-5}) = 4.52
According to the working pH range of this indicator, the color shown for a solution of pH 4.52 is green.

Option 3 is incorrect.
Aqueous solution of $MgCl_2$ is weakly acidic (pH 6.5) due to hydrolysis.
$[Mg(H_2O)_6]^{2+} \rightleftharpoons [Mg(H_2O)_5OH]^{+} + H^{+}$
According to the working pH range of this indicator, the color shown for a solution of pH 6.5 is blue.

28 Which of the following statements about Period 3 elements, Na to Cl, are correct?

1 The atomic radius of the elements decreases across the period.

2 The oxidation number the elements show in their oxides increase across the period.

3 The pH of the solution when the chlorides of the elements is dissolved in water increases across the period.

Ans: B
Option 1: Correct
Across a period, nuclear charge increases and shielding effect remains approximately constant. Effective nuclear charge increases, electrons are pulled towards the nucleus

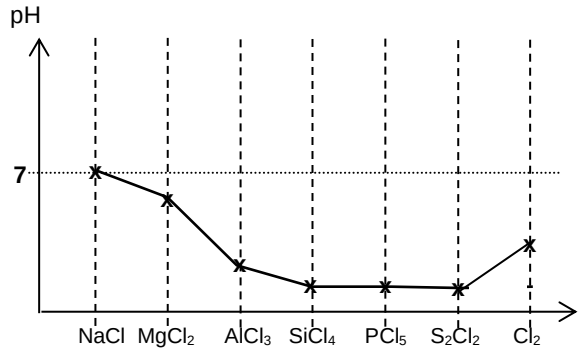
atomic radii decrease

Option 2: Correct

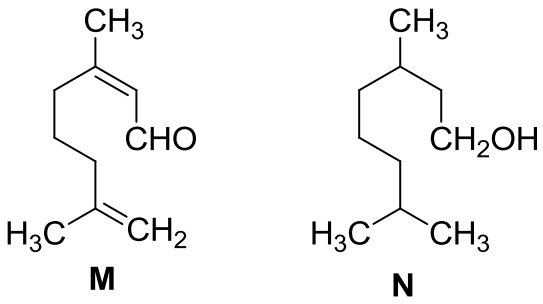
Element	Na	Mg	Al	Si	P	S	Cl
Formula of Oxide	Na_2O	MgO	Al_2O_3	SiO_2	P_4O_6, P_4O_{10}	SO_2, SO_3	Cl_2O, ClO_2, Cl_2O_7
Oxidation numbers	+1	+2	+3	+4	+3, +5	+4, +6	+1, +4, +7
No. of valence electrons	1	2	3	4	5	6	7

❖ The maximum attainable oxidation number of each element corresponds to the number of valence electron(s) in each atom of the element. All the electrons can be used for bonding.

Option 3: Incorrect: pH of the solution generally decreases across the period
Variation of pH of resultant mixture when Period 3 chloride is added to water



29 The two compounds **M** and **N** shown below are important flavours in citrus fruits. These compounds are commonly used in the food and perfume industries.



Which statements concerning **M** and **N** are correct?

1 **N** can be distinguished from **M** by using sodium metal.

2 Reaction of **M** with hot acidified $KMnO_4$ gives two organic products.

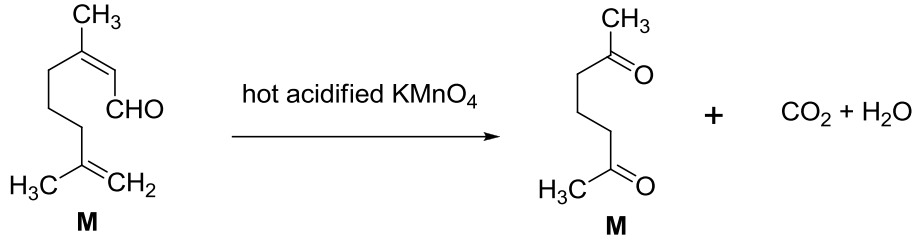
3 **M** can be converted to **N** using lithium aluminium hydride in dry ether.

Ans: D

Option 1: Correct

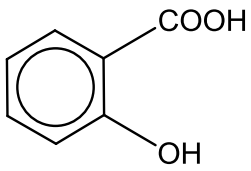
1° alcohol in N can react with sodium metal. Thus effervescence of H2(g) will be seen for N but not M.

Option 2: Incorrect. Reaction of M only give 1 organic product as HOOC-COOH is further oxidised to CO_2 and H_2O



Option 3: Incorrect. Alkene will not undergo reduction with lithium aluminium hydride in dry ether.

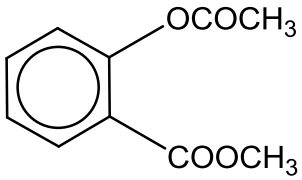
30 Salicylic acid is an important compound in the medical and cosmetic industries.



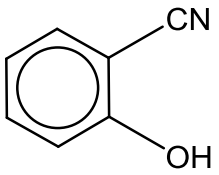
Salicylic acid

Which compounds would give salicylic acid on acid hydrolysis?

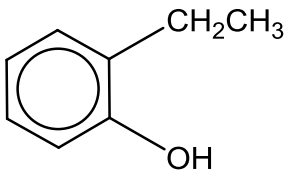
1



2

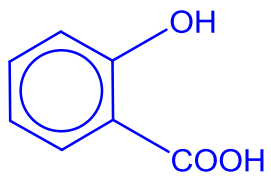


3



Solution:

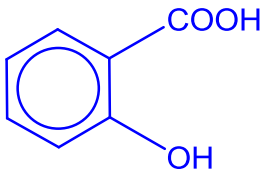
For option 1:



+ CH_3COOH

+ CH_3OH

For option 2:



+ NH_4^+

For option 3:

No reaction

Therefore, 1 and 2 produces salicylic acid.

Ans: **B**

Solutions

1	D	**6**	D	**11**	A	**16**	D	**21**	B	**26**	D
2	C	**7**	B	**12**	C	**17**	C	**22**	D	**27**	B
3	A	**8**	A	**13**	A	**18**	B	**23**	C	**28**	B
4	B	**9**	D	**14**	A	**19**	C	**24**	C	**29**	D
5	A	**10**	D	**15**	A	**20**	A	**25**	D	**30**	B