Name:		Index Number:		Class:	

DUNMAN HIGH SCHOOL
Preliminary Examination 2018
Year 6

H1 CHEMISTRY

8873/01

Paper 1 Multiple Choice

24 September 2018
1 hour

Additional Materials: Data Booklet
Optical Mark Sheet

INSTRUCTIONS TO CANDIDATES

1 Write your **name**, **index number** and **class** on this question paper and the OTAS Mark Sheet.

2 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 Optical Mark Sheet.

3 Each correct answer will score one mark. A mark will not be deducted for wrong answer.

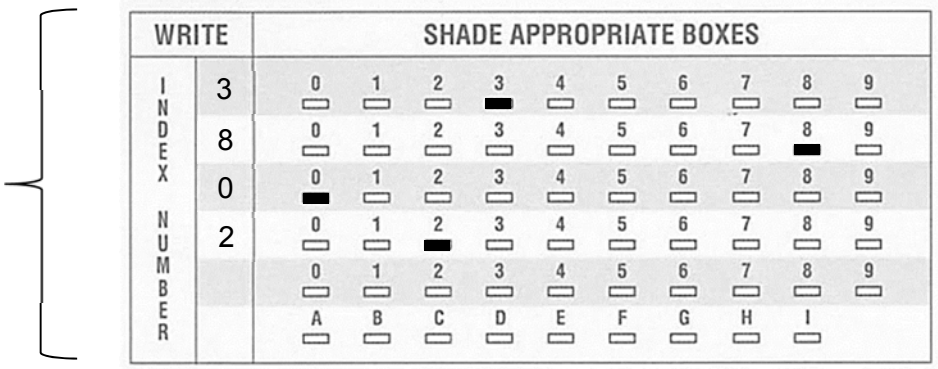
4 Any rough working should be done in this booklet.

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

6 On the OTAS Mark Sheet, please shade the code as "Class/Index number".

For illustration only:

A student from class 6C38, with index number 02, should shade "3802".



1 Which option contains one mole of the stated particles?
Note that D = $^{2}_{1}H$.

A carbonate ions in 60 g of sodium carbonate

B neutrons in 1.8 g of heavy water, D_2O

C electrons in 0.1 mol of OH^-

D oxygen atoms in 11.2 dm^3 of O_3, under s.t.p

2 NF_3 can be obtained from the reaction between ammonia and fluorine gas.

$$4NH_3 + 3F_2 \rightarrow NF_3 + 3NH_4F$$

Which statement about the reaction is correct?

A NH_3 undergoes disproportionation.

B The oxidation number of nitrogen in NF_3 is +3.

C NH_3 is a stronger oxidising agent than F_2.

D One mole of F_2 loses two moles of electrons.

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

Which statement regarding $^{26}Mg^{2+}$ and $^{27}Al^{3+}$ ions is true?

1 $^{26}Mg^{2+}$ has more protons than $^{27}Al^{3+}$.

2 Both ions have more neutrons than protons in their nuclei.

3 Both ions have outer electronic configuration $2s^22p^6$.

4 Both ions have the same number of neutrons.

A 1 and 2 only

B 1 and 3 only

C 3 and 4 only

D 2, 3 and 4 only

4 In which substance must covalent bonds break on melting?

A calcium

B silicon

C sodium carbonate

D ice

5 Valence Shell Electron Pair Repulsion theory can be used to predict the shapes of molecules and ions.

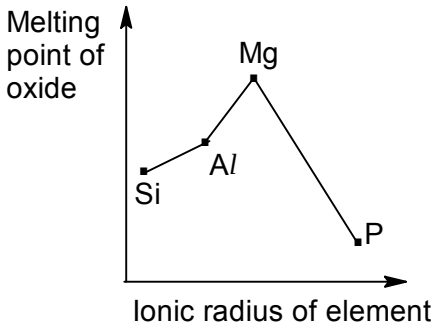
Which of the following are the shapes of NO_2 and NO_3^- respectively?

	NO_2	NO_3^-
A	linear	trigonal planar
B	linear	trigonal pyramidal
C	bent	trigonal planar
D	bent	trigonal pyramidal

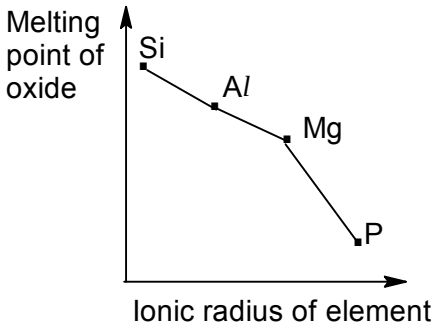
6 *Use of the Data Booklet is relevant to this question.*

Which graph shows the correct trend when the melting points of the oxides of elements Mg, A*l*, Si and P is plotted against its ionic radius?

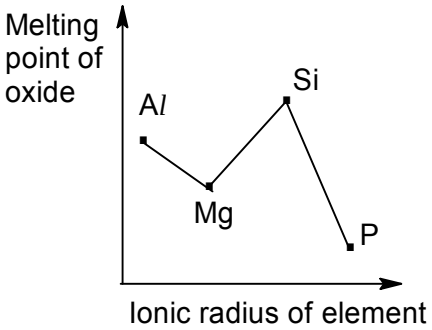
A



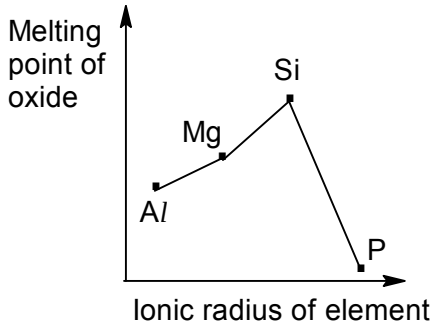
B



C



D



7 Two different Group 1 metals, **K** and **L**, were separately thrown into two beakers of cold water. **K** skipped on the water surface and effervesence was seen. **K** disappeared after sometime. **L** exploded upon contact with water.

Which statement is **false**?

A **L** could be rubidium if **K** is sodium.

B **K** is a stronger reducing agent than **L**.

C Hydrogen gas is given off when **L** came into contact with water.

D The water in the beaker becomes basic upon reacting with **K**.

8 $\mathbf{X_2}$, $\mathbf{Y_2}$ and $\mathbf{Z_2}$ are Cl_2, Br_2 and I_2 but are not necessarily in the given order.

The table below recorded observations when these halogens are separately added to aqueous solutions containing the halide ions followed by the addition of an organic solvent, CCl_4.

Experiment	Reactants	Observation after shaking with CCl_4
1	$\mathbf{X_2}$ (aq) + $\mathbf{Y^-}$ (aq)	Violet organic layer seen.
2	$\mathbf{Y_2}$ (aq) + $\mathbf{X^-}$ (aq)	*(Observations not recorded)*
3	$\mathbf{Z_2}$ (aq) + $\mathbf{X^-}$ (aq)	Orange-red organic layer seen.
4	$\mathbf{Z_2}$ (aq) + $\mathbf{Y^-}$ (aq)	Violet organic layer seen.

Which statement could be deduced from the above experiments, given $\mathbf{X_2}$ (aq) is an orange solution?

A The colour of the organic layer in Experiments 2 and 4 is the same.

B Identity of $\mathbf{Z_2}$ is Br_2.

C In Experiment 3, there is no redox reaction occurring.

D $\mathbf{X_2}$ is a stronger oxidising agent than $\mathbf{Z_2}$.

9 For which process is the enthalpy change always negative?

A Melting of ice.

B Reaction between an acid and a base.

C Breaking a covalent bond of a diatomic molecule.

D Forming a compound from its elements.

10 A rock sample was found to contain isotopes **T** and **U** which are radioactive. Initially, the ratio of the number of atoms of **T** to **U** in the rock sample is 1 : 16. The decay of isotopes **T** and **U** was found to follow first order kinetics. The half–life of **T** is 12 days while that of **U** is 3 days.

How long, in days, will it take for a rock sample to contain a molar ratio of **T** to **U** of 4 : 1?

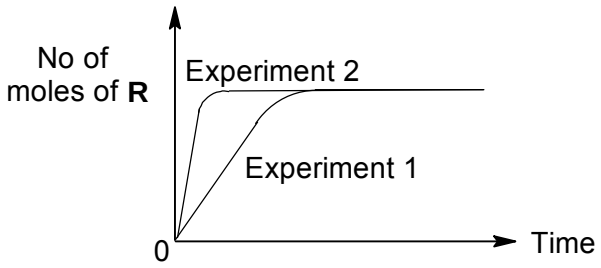
A 6 **B** 12

C 18 **D** 24

11 The stoichiometry of a reaction is shown by the equation below.

$$\mathbf{L}(g) + \mathbf{M}(g) \rightleftharpoons \mathbf{Q}(g) + \mathbf{R}(g) \qquad \Delta H = -20 \text{ kJ mol}^{-1}$$

Two experiments were carried out in enclosed vessels which the rate of production of **R** was measured. The results are shown in the diagram below.



Which changes in the conditions might explain the results shown?

1 Temperature of the vessel in Experiment 2 is higher.

2 A smaller vessel is used in Experiment 2.

3 A catalyst is used in Experiment 2.

A 1, 2 and 3 **B** 1 and 2 only

C 2 and 3 only **D** 1 only

12 In which reaction is the first reactant **not** acting as a Bronsted-Lowry base?

A $\underline{NH_3} + CH_3Cl \rightarrow CH_3NH_3^+ + Cl^-$

B $\underline{OH^-} + HSO_4^- \rightarrow H_2O + SO_4^{2-}$

C $\underline{CH_3OH} + HClO_4 \rightarrow CH_3OH_2^+ + ClO_4^-$

D $\underline{HNO_3} + H_2SO_4 \rightarrow H_2NO_3^+ + HSO_4^-$

13 Nanoparticle zinc oxide is an ingredient found in most sunscreens. The white bulk powder form of zinc oxide is not used even though it can absorb UV rays.

Which statement about zinc oxide as a nanoparticle is true?

1 Zinc oxide is not white owing to the extremely small size of the nanoparticle.

2 Nanoparticle zinc oxide is water soluble.

3 Zinc oxide can absorb UV rays only when it is in nanoparticle form.

4 Since the surface area to volume ratio is very high, nanoparticle zinc oxide can be applied to the skin more evenly.

A 1, 2 and 4 only

B 2 and 3 only

C 1 and 4 only

D 3 and 4 only

14 Which statement explains why graphene is such a strong material?

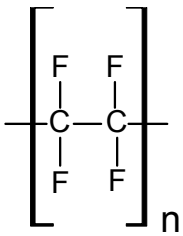
A Graphene is a crystalline allotrope of carbon.

B Graphene exists as a three dimensional structure.

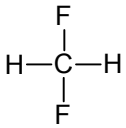
C The layered structure of graphene allows the layers to slide over each other.

D The strong network of carbon–carbon covalent bonds that exists in graphene.

15 A polymer is formed as a result of addition polymerisation and it has the following structure.



Which is the monomer?

A


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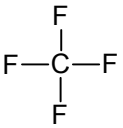

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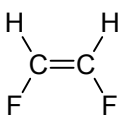
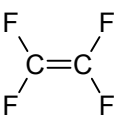
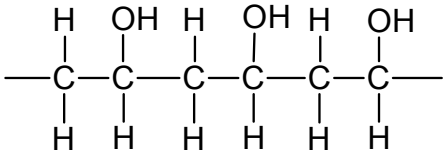


D


16 Poly(vinyl alcohol) is a commonly used eye drop and has the structure shown below.



poly(vinyl alcohol)

Which of the following properties makes poly(vinyl alcohol) suitable for its use?

1 The polymer is transparent.

2 It is fairly soluble in water.

3 It has high heat resistance.

4 It attracts water to itself.

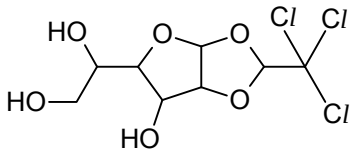
A 1, 2 and 4 only

B 2 and 3 only

C 1 and 4 only

D 3 and 4 only

17 Chloralose is a drug that is commonly used in neuroscience as an anesthetic.



chloralose

How many sp^2 hybridised carbon atoms and secondary alcohol does chloralose have?

	No. of sp^2 hybridised carbon atoms	No. of secondary alcohol
A	0	3
B	0	2
C	3	3
D	3	2

18 Which statement is correct regarding alkanes?

A They undergo substitution reactions.

B The carbon atoms in alkanes are sp^2 hybridised.

C They are generally unreactive due to the polar C–H bond.

D Propane reacts with chlorine gas to give three different mono–substituted products.

19 Compound **Z** can be obtained by a two-step process involving intermediate **X**.

$$HOOCCH{=}CHCOOH \xrightarrow{\textbf{step 1}} \textbf{X} \xrightarrow{\textbf{step 2}} \underset{\textbf{Z}}{HOOCCOCH_2COOH}$$

What is the identity of intermediate **X**?

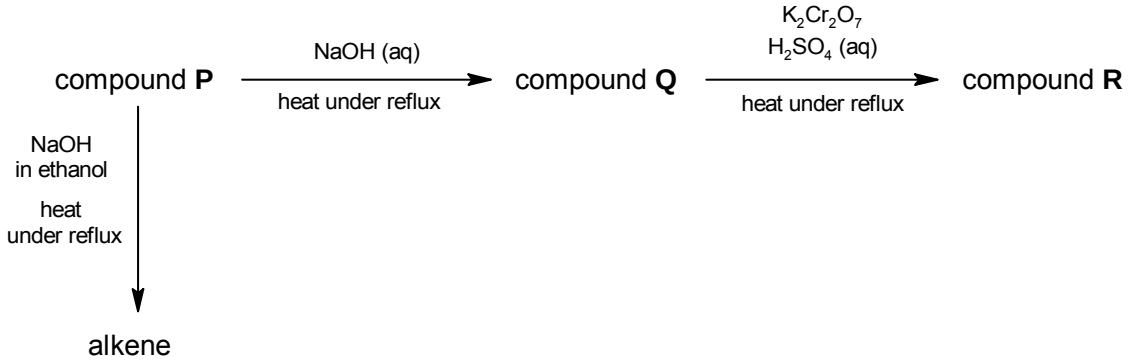
A $HOOCCH_2CH_2COOH$

B $HOOCCHBrCH_2COOH$

C $HOOCCH(OH)CH_2COOH$

D $HOOCCH(OH)CH_2OH$

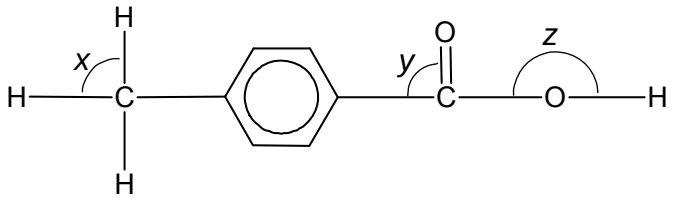
20 The flow chart shows a series of reactions.



Which class of compound are **P**, **Q** and **R**?

	P	Q	R
A	halogenoalkane	primary alcohol	carboxylic acid
B	halogenoalkane	primary alcohol	aldehyde
C	primary alcohol	aldehyde	carboxylic acid
D	primary alcohol	halogenoalkane	aldehyde

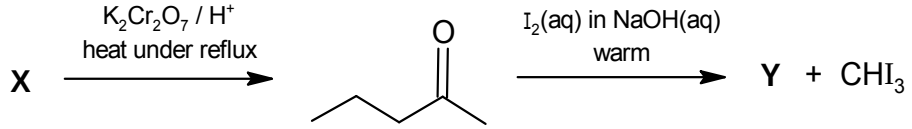
21 A compound has the structure shown.



What are the values of the bond angles *x*, *y* and *z*?

	x	*y*	*z*
A	90°	109.5°	104.5°
B	90°	120°	180°
C	109.5°	109.5°	180°
D	109.5°	120°	104.5°

22 The diagram shows reactions involving pentan–2–one.



Which row correctly identifies compounds **X** and **Y**?

	X	**Y**
A	pentan–1–ol	sodium butanoate
B	pentan–2–ol	sodium butanoate
C	pentan–1–ol	sodium pentanoate
D	pentan–2–ol	sodium pentanoate

23 Which reagent is able to distinguish between the following two compounds?

CH_3CONH_2 $CH_3OCOCH_2CH_3$

A Hot aqueous NaOH

B Liquid bromine

C 2,4–dinitrophenylhydrazine

D Concentrated H_2SO_4

24 Which products are formed when butanal reacts with Fehling's solution?

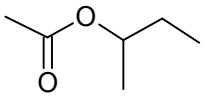
A Cu_2O and $CH_3CH_2COO^-$

B Cu_2O and $CH_3CH_2CH_2CH_2OH$

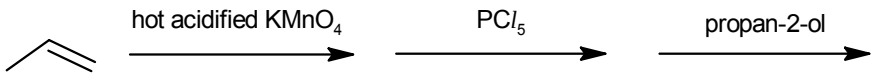
C Cu_2O and $CH_3CH_2CH_2COO^-$

D CuO and $CH_3CH_2CH_2COO^-$

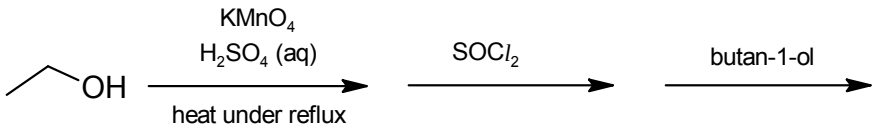
25 Which synthetic route will give the following ester as the product?



A



B



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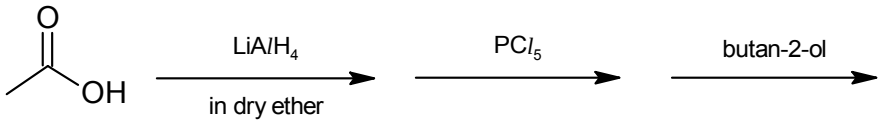

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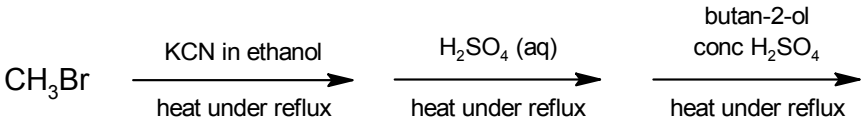


26 Hoping to make ethyl propanoate, a student mixed propanoic acid and ethanol, added a little concentrated sodium hydroxide solution as catalyst and left the mixture in a sealed container in a warm water bath for several days. The experiment failed.

What was the only thing the student got wrong?

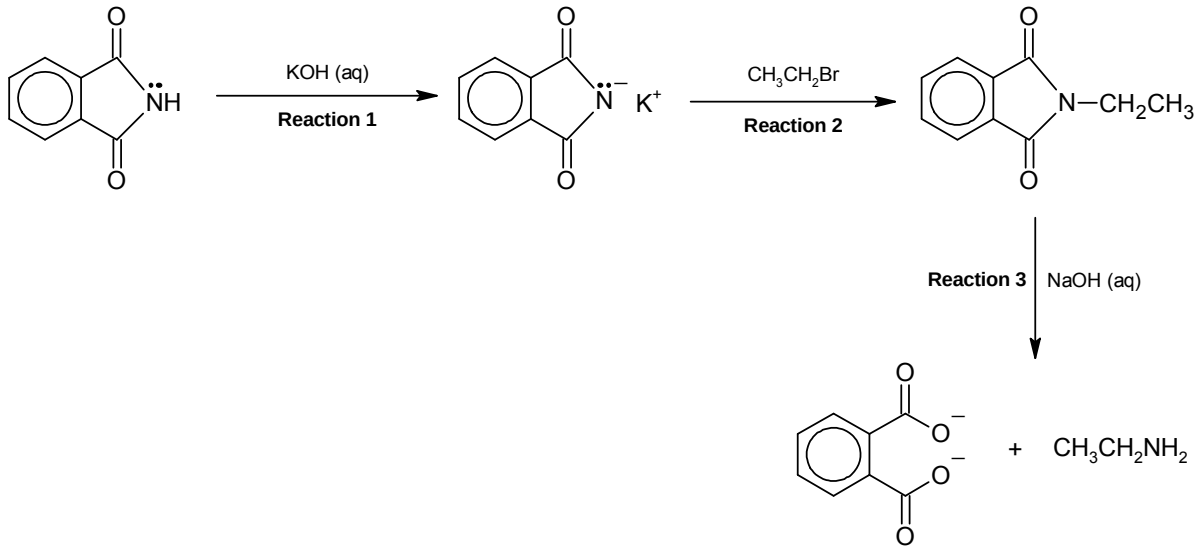
A the use of propanoic acid

B the use of ethanol

C the addition of a little concentrated sodium hydroxide solution

D leaving the mixture in a warm water bath for several days.

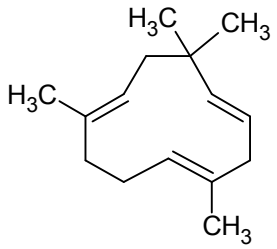
27 The diagram below shows a sequence of reactions.



How can the three reactions be classified?

	Reaction 1	Reaction 2	Reaction 3
A	hydrolysis	substitution	acid–base
B	hydrolysis	addition	acid–base
C	acid–base	substitution	hydrolysis
D	acid–base	addition	hydrolysis

28 Humulene can be extracted from carnation flowers.



Humulene is treated with hot, concentrated acidified $KMnO_4$.

Which compound will be found in the mixture of products?

1 $CH_3COCH_2CH_2CO_2H$

2 $CH_3COCH_2CO_2H$

3 $HO_2CCH_2C(CH_3)_2CO_2H$

4 $HO_2CC(CH_3)_2CO_2H$

A 1 and 4 only

B 2 and 3 only

C 1, 3 and 4 only

D 1, 2 and 3 only

29 One mole of compound **Q** reacts with an excess of sodium to produce one mole of hydrogen gas.

What could **Q** be?

1 HO_2CCH_2CHO

2 $HOCH_2CH_2OH$

3 CH_3CO_2H

A 1 only

B 2 only

C 2 and 3 only

D 1, 2 and 3 only

30 When one ethene molecule reacts with one bromine molecule by electrophilic addition, how many bonds are broken and formed?

	number of σ bonds broken	number of π bonds broken	number of σ bonds formed	number of π bonds formed
A	1	1	2	0
B	0	1	2	0
C	1	0	0	2
D	1	1	0	2

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2018 DHS YEAR 6 H1 CHEMISTRY (8873) Preliminary Examination
Paper 1 MCQ – Answers

1	2	3	4	5	6	7	8	9	10
C	**B**	**D**	**B**	**C**	**A**	**B**	**A**	**B**	**D**

11	12	13	14	15	16	17	18	19	20
C	**A**	**C**	**D**	**D**	**A**	**B**	**A**	**C**	**A**

21	22	23	24	25	26	27	28	29	30
D	**B**	**A**	**C**	**D**	**C**	**C**	**D**	**B**	**A**