Dunman Secondary school

2025 Science Prelims

Sec 4 express/5NA

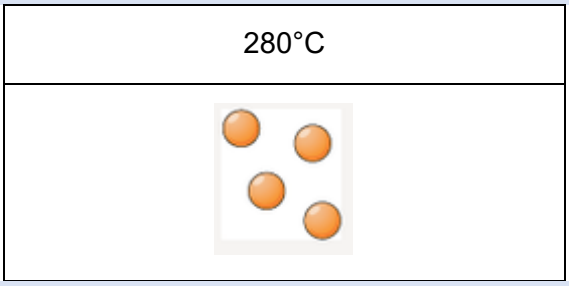
Answers Paper 3

Question 1

1ai	**B [1]**
aii	**F and G [1]**
aiii	**C and F/G [1]**
aiv	**A [1]**
bi	**Isotopes are atoms of the same element with a different number of neutrons, but same number of protons and electrons. [1]**
bii	**D and E [1]**

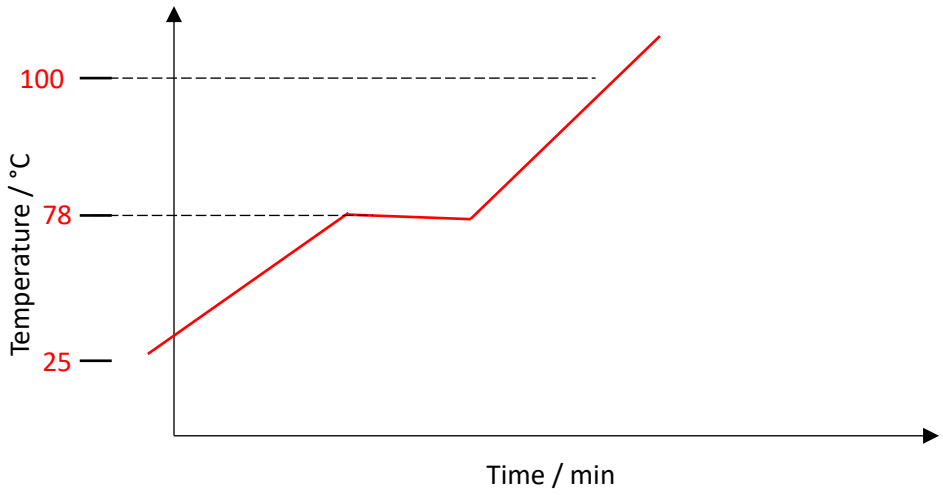
Question 2

ai



aii In solids, the geosmin particles are vibrating about their fixed position but in a liquid, geosmin particles are sliding across each other.

This sample of geosmin was heated from 25°C to 100°C. Using the axes below, draw the heating curve for this sample of geosmin.



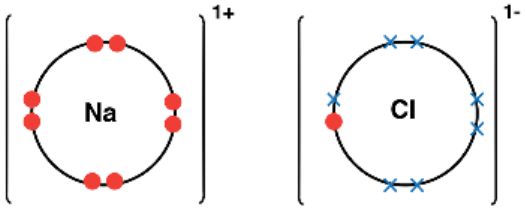
- To label 25°C and100°C, and draws correctly shaped graph at these temperatures [1]
- substance to melt around 78°C, horizontal line at 78°C(labelled) [1]

Question 3

3a
- Solid sodium chloride exists as a giant lattice structure with ions vibrating about fixed positions due to strong electrostatic forces of attraction [1]
- hence no mobile ions and cannot carry charge [1]

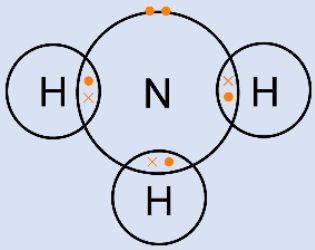
b
- **ammonia gas exist as simple covalent molecules held together by weak intermolecular forces of attraction. [1]**
- **hence, a little heat energy is required to overcome these forces of attraction. [1]**

3ci



NB:
Award 1M for correct charges
Award 1M for correct electron arrangement

3cii



NB:
Award 1M for correct number of atoms
Award 1M for correct electron arrangement

Question 4

4a
A: Zinc nitrate [1]
B: Zinc hydroxide [1]
C: ammonia gas [1]
D: aqueous ammonia [1]

4b [1] equation +balancing, [1] state symbols

Possible answers:
$Zn(NO_3)_2$ (aq)+ 2NaOH (aq)→ $Zn(OH)_2$ (s) + $2NaNO_3$ (aq)

Question 5

5a Initial: 19.0
Final: 28.0
Change: 9.0

NB:
1m- 1 or 2 correct
2m- all 3 correct

5b
- An exothermic reaction [1]
- occurred as temperature of the surroundings increased. [1]

5c H^+ (aq) + OH^- (aq) → H_2O (l) [1]

Question 6

6a **4**

6b
- **Lemongrass is not pure / is a mixture and citronellol oil is pure.[1]**
- **Lemon grass contains citronella and one other component. [1]**

6c **$C_{10}H_{20}O$ [1]**

Question 7

7aii **Reddish brown liquid**

7bi **$2KI + Cl_2 \rightarrow 2KCl + I_2$**
NB: 1M for correct chemical formula, 1M for balanced equation

7bii
- **Solution changes colour from colourless to brown. [1]**
- **A black solid is deposited at the bottom of the test tube. [1]**

7biii
- **Chlorine gas is reduced as it gained one electron to form chloride ions.[1]**
- **Iodide ion is oxidised as it lost one electron to form iodine. Since both oxidation and reduction is occurring at the same time, the reaction is a redox reaction. [1]**

Question 8

8a No. moles of $FeCO_3$ = 2.32 / [56 + 12 + 3(16)] = 0.02 mol [1]

8b No. moles of CO_2 = 0.02 mol [1]
Volume of CO_2 = 0.02 x 24 = 0.48 dm^3 [1]

8c No. moles of $FeCl_2$ = 0.02 mol
Mass of $FeCl_2$ = 0.02 mol x [56 + 2(35.5)] = 2.54 g [1]

8d **Concentration =** $\frac{number\ of\ moles}{volume}$
= $\frac{0.04}{50/1000}$
= 0.8 mol/dm^3 [1]

Question 9

9a Road vehicles

9b
- The high temperature in internal combustion engine of the car[1]
- resulted in nitrogen and oxygen in the air to react together to form nitrogen dioxide. [1]

9c Lightning activity.

9d

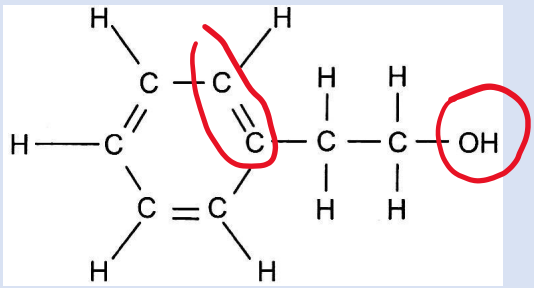
environment:	Oxides of nitrogen dissolves in rain water causes acid rain which corrodes building and metal bridges. [1]
human:	Oxides of nitrogen is an acidic gas which irritates the lungs resulting in breathing difficulties / irritates the eyes. [1]

9ei
- Sugarcane **absorbs carbon dioxide during photosynthesis** to convert to oxygen[1]
- which **offsets the carbon dioxide produced** when bioethanol is burnt.[1]

9eii
- Fermentation of glucose solution[1]
- Presence of yeast at 37.5°C in the absence of oxygen. [1]

Question 10

10ai

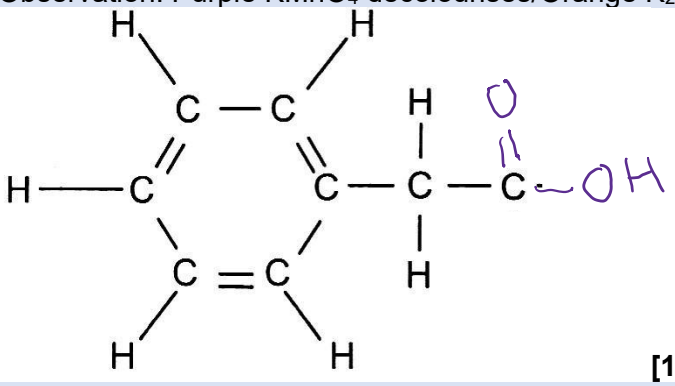


NB: Both functional group needs to be circled. [1]

10aii No. It contains **<u>oxygen</u>** atom.[1]

10aiii Chemical reagent: (acidified) potassium manganate(VII)/ potassium dichromate (VI)[1]

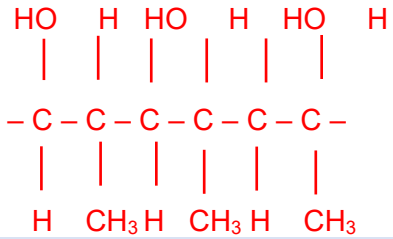
Observation: Purple $KMnO_4$ decolourises/Orange $K_2Cr_2O_7$ turns green. [1]



[1]

bi
- Compound X has a <u>carbon-carbon double bond</u> [1]
- Bubble compound gas into<u>aqueous bromine / bromine water. [1]</u>
- if aqueous bromine <u>decolourises from reddish brown to colourless</u>, an unsaturated compound is present. [1]

10bii
- Correct number of repeating units x3 [1]
- Correct atoms and configuration [1]

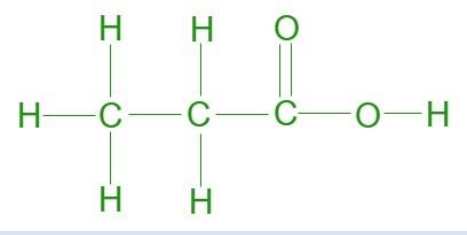


Question 11

11a
- A group of compounds having the same function group – carboxyl, COOH
- Same general formula – $C_nH_{2n+1}COOH$ (where n starts from 0)
- Each member differs from the next by a unit of $-CH_2$.
- Undergo similar chemical reactions.

NB: Accept any 2 points, max 2 marks

11b Name: propanoic acid [1]



[1]

11ci Name: Ethanol
Chemical formula: C_2H_5OH
NB: both must be correct for 1m to be awarded

11cii C_2H_4 (g) + H_2O (g) → C_2H_5OH (l) [2]

11d

chemical test:	Add some calcium carbonate [accept any carbonate] into separate test tubes containing each sample. [1]
result with ethanoic acid:	Effervescence observed. [1]
result with alcohol **Y**:	No visible reaction. [1] ® no reaction.