## **Organic chemistry 1**

- 1. a) Bromine decolorized immediately in ethane gas  $\sqrt{1}$ 
  - b) Temperature between 150°C 250°C or temperature of 180°C
  - c) Carbon (IV) oxide or  $CO_{2(g)}$   $\sqrt{\phantom{CO_{2(g)}}}$
- 2. *(a) Butane* 
  - (b) Manufactures of cooking fats and margarine

4. a) Existence of cpds with the same molecular formula but different structural formula/arrangement of atoms

R Group 
$$2 \stackrel{\sim}{=} \frac{1}{2}$$
, Period  $3 \stackrel{\sim}{=} \frac{1}{2}$ 

$$W-H \quad C- \quad C = C \qquad C- \quad H$$

7. a) To produce simpler hydrocarbons of industrial importance e.g. ethane which is widely used

b) Elevated temperature / high temperature 900 C

Catalyst

c) 
$$HC - CCH_3$$

8. a) Reagent concentrated sulphuric acid

Condition temperature 180° C

Name: 2, 3 dichloropentane

b) i) Structural Formula

$$H H H H$$
 $| | | |$ 
 $H - C = C - C = C - C - H$ 
 $| | | |$ 
 $H H H$ 

ii) IUPAC name

10. Isotopes are atoms of the same element with same atomic number but different mass numbers while isomers are compounds with the same molecular formula but different structural formula

11. Addition polymerization.  $\sqrt{1}$ 

12. (a) When gases combine they do so in volume which bear a simple ratio to one another and to the product if gaseous under standard temperature and pressure

13. 
$$CH4 + 2O_{2(g)}$$
  $CO_{2(g)} + 2H_{2(l)}$   
 $10cm^3 \ 20cm^3$   $10cm^3 \ 1/2$   
Volume of  $O_2 = \underline{20} \times 150$   
 $100 \ 1/2$   
 $= 30cm^3$ 

Remaining volume of  $O_2 = 30-20=10cm^3$ Total volume of the gases = 20+10+10=  $40cm^3$  ½

14. (i) 
$$H - C \equiv C - C - C - C - C - H^{\uparrow}$$

$$CI H H H$$

(ii) 
$$H - C - O - H^{\dagger}$$

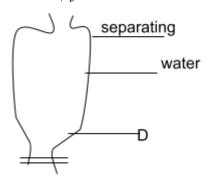
H

15. 
$$T_2 = \frac{690 \times 15 \times 259}{650 \times 105}$$
$$= 39.3 \text{K}\sqrt{}$$
$$= -233.7^{\circ} \text{C}\sqrt{}$$

16. 
$$CH_2 = CH_{2g} + H_2SO_{4(L)}$$
  $CH_3CH_2OSO_3H_{(aq)} \sqrt{1 \text{ mark}}$ 

- 17 (a) i) Fractional Column.
  - ii) fractional distillation.
  - iii)different boiling points.

b) G – road making or water proofing C jet fuel or cooking and lighting.



- 18. (i) ethyne
  - (ii) Alkynes because it has triple bond between the two carbon atoms
  - (iii) Water is calcium carbide
  - (iv) Colourless, odourless
    - -less denser than air
    - Insoluble in water but soluble in organic solvents
  - (v) Hydrogenation
  - (vi) Halogenations

- (viii) Carbon (IV) Oxide
- (ix) Nitrogen I Oxide  $(N_2O)$

H H

- (ii) B It has the second lowest boiling point thus second lowest molecular mass
- (iii) C is impure since it boils over a range of temperature
- (iv) It is boiled heated and the vapour of the components condense at different temperatures
- (v) Liquid air
  - Crude oil
- 20. (a) (i) Gas /vapour
  - (ii) B It has the second lowest boiling point thus second lowest molecular mass
  - (iii) C is impure since it boils over a range of temperature
  - (iv) It is boiled heated and the vapour of the components condense at different temperatures
  - (v) Liquid air
    - Crude oil
- 21. a) i) Bitumen it has the highest boiling point
  - ii) Fractional distillation; during distillation petrol would distill off at 175C, while diesel will distill at 350C
  - iii) Each component is a mixture of hydrocarbons which have different boiling points
  - iv) Methane,  $CH_4$ , Ethane  $C_2H_6$  propane,  $C_3H_8$ , Butane  $C_4H_{10}$
  - b) i) Burning in limited amount of air will produce carbon monoxide (carbon (II) Oxide) which is poisonous
    - ii) Manufacture of Tar used in road tarmacking sealing of leakages on roofs
- 22. A. (i) Calcium carbide  $CaC_2$ 
  - (ii) Over water method
  - (iii)  $CaC_{2(s)} + 2H_2O_{(s)} + 2H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)} + C_2H_{2(g)}$
  - (iv)  $C_2H_2 + 2I_2 C_2H_2I_2$
  - (v) The reaction if highly exothermic hence sand helps to absorb excess heat.
  - B. (i) A reaction in which an organism acid reacts with an alkanol to form a sweet smelling compound called ester.
    - (ii)  $CH_3COOCH_3 + H_2O$   $CH_3COOH + CH_3OH$
  - (iii) Hydrolysis
  - C (i)  $F Aluminium \ oxide Al_2O_3$

$$N - C_6 H_{14} - Hexane$$

- (ii) Cracking
- D. A fuel
- 23. i) Cracking of crude oil fractions.  $\sqrt{1}$ 
  - *ii)*  $Temp 400 500^{\circ}c$

Pressure - 200 - 500 atmospheric Any 2 = 1

Catalyst - Finally divided iron.

- iii)  $4NH_3(g) + 5O_2(g) 4NO(g) + 6H_2O(l)$
- iv) Manufacture of nitrate fertilizers. √1
  - Manufacture of explosives.
  - Purification of metals.
- b) Red brown gas  $\sqrt{1}$  with pungent irritating smell due to reduction of HNO<sub>3</sub> to NO<sub>2</sub>
  - Blue  $\sqrt{1}$  solution due to formation of Cu  $(NO_3)_2$
- 24. (a) (i) 2-bromo propene or 2- bromo prop-i-ene
  - (ii) Pent-i-ene

- (b) (i) Changes form orange to Green
  - (ii) Effervescence//bubbles of gas produced
- (c) Step 1
  - Fermentation of glucose

Glucose broken down in obscene of oxygen using enzymes

- Dehydration of ethanol; using concentrated sulphuric (VI) acid and high temperature of 170°C

## Step II

- Dehydration of ethanol; using concentrated sulphuric (VI) acid and high temperature of 170°C
- (d) Compound A
- (e) release chlorine gas which destroy ozone layer
- Chlorine gas combines with vapour in atmosphere to form acid rain which destroy vegetation
- Chlorine gas can cause respiratory diseases
- *25*. (a) (i) 2,2 – dimethyl pentane
  - (b) I carbon IV oxide.

II Hydrogen gas.

III Propane.

(ii) I Hydrogenation.

II Neutralization

III substitution

- (iii)  $CH_3CH_2CH_2Ol + 902_{(g)} 6 CO_{2(g)} + 8 H_2O_{(l)}$
- (iv) Condition Presence of U.u light

Reagents – Chlorine gas

(v)  $CH_3CH_2COONa + NaoH \longrightarrow CH_3CH_2COONa + H_2O_{(c)}$ 

Mole ratio:

74 tones of acid

21.9

96 tones of salt

 $21.9 \times 96 = 28.4 \text{ tones}$ 74

 $= 0.29 \times 96 = 28.4 \text{ tones}$ 

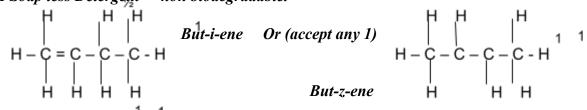
- $\begin{vmatrix} 1 & 1 & CH \\ -C & -C & -C \end{vmatrix}$
- (ii) use in making Plastic crates plastic boxes plastic ropes
  - (c) I (i) soap

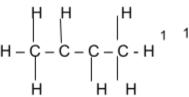
detergent

(ii) Soap less detergent

II Soap less Detergent - non biodegradable.

26. (i)





(ii) Bromine water is decolourised because X is unsaturated or has a (-C = C-) double bond.

(iii) 
$$C_3H_{8(g)} + 5O_{2(g)}$$

$$3CO_{2(g)} + 4H_2O_{(l)}$$

27. a) i) Propane

ii) But- 2 -yne

b) i) Ploythene

ii) Bubble pass ethane gas in acidified KMnO4 or acidified K2Cr2OT

c) i) CnH2n

ii) @5H10

d) i) Step I – hydrogen

Step II – Hydrogen chloride

Step IV – Sodalime

*ii)* 
$$2CH = CH(g) + O2(g)$$
  $4CO2(g) + 2H2O(L)$ 

- A fuel
- Manufacture of methanol
- Manufacture of methanol

28. i) 2 - Methylprop - l ene  $\sqrt{1}$  mark

ii) Pent – L – yne

$$\sqrt{1}$$
 mark

[Total 12 marks]

29. The melting point increases from A to C this is due to increase in number delocalized electron hence increase in the strength of metallic bond.

D forms a giant structure with strong covalent bonds. Hence high melting.

It exhibits allstrophy ie may exist as two different form in the same state.

C2 (so4)3

Noble gases or inert

Used in filament bubls

Used to produce an inert atmosphere in high temperature inetallurgical processes e.g welding. C is amphoteric oxide

F acidic it is non -metal oxide.

Ethene

Acidified potassium Manganate VI abromine water it from a colourless solution

$$CH_2CH_2 + H_2 \longrightarrow CH_3CH_3$$

Nickel catalyst

30. a) i) Bitumen it has the highest boiling point

- ii) Fractional distillation; during distillation petrol would distill off at 175C, while diesel will distill at 350C
- iii) Each component is a mixture of hydrocarbons which have different boiling points
- iv) Methane,  $CH_4$ , Ethane  $C_2H_6$  propane,  $C_3H_8$ , Butane  $C_4H_{10}$

- b) i) Burning in limited amount of air will produce carbon monoxide (carbon (II) Oxide) which is poisonous
  - ii) Manufacture of Tar used in road tarmacking sealing of leakages on roofs
- i) C<sub>n</sub>H<sub>2n</sub>, where n = No. of carbon atoms
  ii) 70
  iii) C<sub>s</sub>H<sub>10</sub>, CH<sub>3</sub>CH=CHCH<sub>2</sub>CH<sub>3</sub>
  OR CH<sub>3</sub>CH<sub>2</sub>CHCH<sub>2</sub>= CH<sub>2</sub>
  32. (a) Hydrocarbon. √1
  (b) Black specks is carbon Colourless gas is stea Hydrocarbon burn in the form carbon √½ and water √½
- 33.  $NaCl_{(aq)} AgNO_{3(aq)} \longrightarrow NaNO_{3(aq)} + AgCl_{(s)}$   $Moles \ of \ AgCl = \underline{Mass}$  R.F.M  $= \underline{2.36}$  143.5 = 0.016446 moles

Mole ratio Nacl: AgCl

Moles of 
$$NCl = 0.61446$$
 moles  
Mass of  $NaCl = RFM x$  moles

1:1

$$= 58.5 \times 0.016446$$
$$= 0.962091g$$

Mass of solvent (water) = 
$$2.63 - 0.962091$$
  
=  $1.667909g$ 

1.667909g of water dissolves 0.962091g of NaCl 100g of water dissolves =  $100 \times 0.962091g$ 

1/2

- 33.  $24000 \text{cm}^3 = 1 \text{mol}$   $80 \text{cm}^3 = \underline{80 \text{x} 1}$  2400= 0.00333 moles
- 34.. (i)  $CH_3CH = CHCH_3$  But-z-ene (ii)  $CH_3C = CH_2$ ; 2- methyl 1 prop-I-ene  $CH_3$ (iii)  $CH_2 = CHCH_2CH_3$  - But-I-ene
- 35. (a) Octane or CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>
- 36. a) Existence of same molecular formula but different structural formula  $\sqrt{1}$  b) i)