Organic chemistry 1

1. ***a) Bromine decolorized immediately in ethane gas √1***
b) Temperature between150°C - 250°C or temperature of 180°C
c) Carbon (IV) oxide or $CO_{2(g)}$ √

2. ***(a) Butane***
(b) Manufactures of cooking fats and margarine

3. ***(a)***

(b)

✓ 1

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

b)

n – butane/ ✓½ 2 – butane/ ✓½

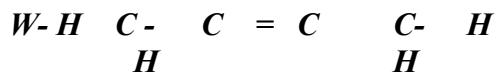
l – butane/ But-2-ene 2 - methyl But-1-ene prop-1-ene

5. a) 2.5

b) Q Group 1 ✓½, Period 4 ✓½

R Group 2 ✓½, Period 3 ✓½

6. a)



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) $HC - C CH_3$

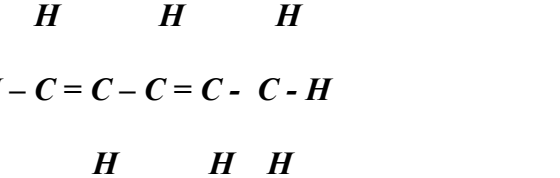
8. a) Reagent concentrated sulphuric acid

Condition temperature 180^o C

9. a) H_2 CHCL $CHCLCH_2CH_3$

Name: 2, 3 dichloropentane

b) i) Structural Formula



ii) IUPAC name

pent – 1,3 – diene

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. ✓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. $CH4 + 2O_{2(g)} \quad CO_{2(g)} + 2H_{2(l)}$

$10cm^3$ $20cm^3$ $10cm^3$ ✓ ½

Volume of $O_2 = \frac{20}{100} \times 150$ ✓ ½

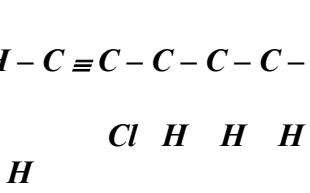
$= 30cm^3$

Remaining volume of $O_2 = 30-20=10cm^3$

Total volume of the gases = 20+10+10

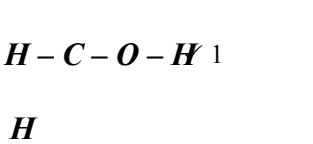
$= 40cm^3$ ✓ ½

14. (i)



✓ 1

(ii)



✓ 1

15.

$T_2 = \frac{690 \times 15 \times 259}{650 \times 105}$ ✓

$= 39.3K$ ✓

$= -233.7°C$ ✓

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

17 (a) i) Fractional Column.

ii) fractional distillation.

iii) different boiling points.

IV I A II F III B

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

(vii)

(viii) Carbon (IV) Oxide ✓

(ix) Nitrogen I Oxide (N_2O)

19. (a) (i) Gas /vapour ✓ 1

(ii) B - It has the second lowest boiling point thus second lowest molecular mass ✓ 1

(iii) C is impure since it boils over a range of temperature ✓ 1

(iv) It is boiled heated and the vapour of the components condense at different temperatures
(v) - Liquid air
- Crude bil

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 bil

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, EthaneC_2H_6propane, 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) $CaC_{2(s)} + 2H_2O_{(s)} + 2H_2O_{(l)}$ $Ca(OH)_{2(aq)} + C_2H_{2(g)}$
(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_6H_{14} – Hexane
(ii) Cracking
D. A fuel

23. i) Cracking of crude oil fractions. √1
ii) Temp – 400 – 500^{0}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 <u>brown gas</u> √1 with pungent irritating smell due to <u>reduction</u> of HNO_3 to NO_2
- Blue √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) $CH_3CH_2CH_2Ol + 902_{(g)} \quad 6\,CO_{2\,(g)} + 8\,H_2O_{(l)}$

(iv) Condition Presence of U.u light

Reagents – Chlorine gas

(v) $CH_3CH_2\,CooH + NaoH \quad CH_3\,CH_2\,COONa + H_2O_{(c)}$

Mole ratio :

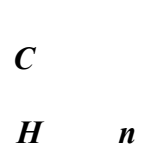
74 tones of acid 96 tones of salt

21.9 $\frac{21.9 \times 96}{74} = 28.4$ *tones*

Or $\frac{21.9}{74} = 0.29$ *moles of salt*

$= 0.29 \times 96 = 28.4$ *tones*

(iv) I



(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) But-i-ene Or (accept any 1) ✓ 1

But-z-ene

✓ 1

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

(iii) $C_3H_{8(g)} + 5O_{2(g)} \quad 3CO_{2(g)} + 4H_2O_{(l)}$ ✓ 1

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 √1 mark
ii) Pent – L – yne √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

$$\begin{array}{l} H \quad H \\ C = C \\ H \quad H \end{array}$$

Acidified potassium Manganate VI abromine water it from a colourless solution

$CH_2CH_2 + H_2 \qquad CH_3CH_3$
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, EthaneC_2H_6propane, 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

31. i) C_nH_{2n}, where n = No. of carbon atoms
ii) 70
iii) C_5H_{10}, $CH_3CH=CHCH_2CH_3$
OR $CH_3CH_2CHCH_2= CH_2$

32. (a) Hydrocarbon. √1
(b) Black specks is carbon
Colourless gas is steam √1 3
Hydrocarbon burn in air to form carbon √½ and water √½

33. $NaCl_{(aq)}$ $AgNO_{3(aq)}$ $NaNO_{3(aq)} + AgCl_{(s)}$
Moles of AgCl= $\frac{Mass}{R.F.M}$
$= \frac{2.36}{143.5}$
$= 0.016446moles$ ✓ ½
Mole ratio Nacl: AgCl
1 :1 ✓ ½
Moles of NCl = 0.61446moles
Mass of NaCl = RFM x moles
= 58.5 x 0.016446
= 0.962091g ✓ ½
Mass of solvent (water) = 2.63 – 0.962091
= 1.667909g ✓ ½
1.667909g of water dissolves 0.962091g of NaCl
100g of water dissolves = $\frac{100 \times 0.962091g}{1.667909}$
= 57.68/100g of water ✓ ½

33. $24000cm^3 = 1mol$
$80cm^3 = \frac{80x1}{2400}$ ✓ 1
$= 0.00333moles$ ✓ 1

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 $CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$ ✓ ½

36. a) Existence of same molecular formula but different structural formula √1
b) i)