Name ..... Class: .....

Start Time ..... End Time ..... Time Taken .....

Time allowed:34 minutes

INSTRUCTIONS TO CANDIDATES

- This document is designed to be used as a practice test.
- Complete the test under exam conditions in one sitting.
- Optional: Before marking it, go through the paper with a set of notes and improve your answers.
- Mark the test using the mark scheme make corrections on the paper.
- Complete the table on the front page.
- Improve your notes so that they better reflect your weaknesses.
- Make a note of your strengths and weaknesses for future revision.

Mark Scheme

Success Criteria	**Questions in Paper**	**Mark**	**Out of**	**%**	**Rank Order**
General and nomenclature	3b		1		
Forming Aliphatic Amines	1d, 2a,		2, 6		
Forming Aromatic Amines	1a, 1b, 2b		3, 1, 5		
Basic Properties of Amines	1e		2		
Nucleophilic Properties of Amines	3c		6		
Organic Synthesis pathways	1c, 3a		5		
			22		

Q1.

(a) Step 1 Conc HNO_3

M1

Step 1 Conc H_2SO_4

If conc missing in both allow 1 for HNO_3 and H_2SO_4

M2

Step 2 Sn and HCl

*Allow Fe and HCl **or** Ni and H_2*

M3

(b) (nucleophilic) addition-elimination

1

(c) Chlorine

Allow Cl_2

M1

UV (light)

Allow sunlight / High temp (above 300°C)

M2

(d) In Step 5 further substitution / gives other amine products

1

In Step 2 only one amine

1

(e) In B Alkyl group is electron donating or positive inductive effect

Or In A lone pair (on N partially) delocalised

1

Lone pair <u>on N</u> more available

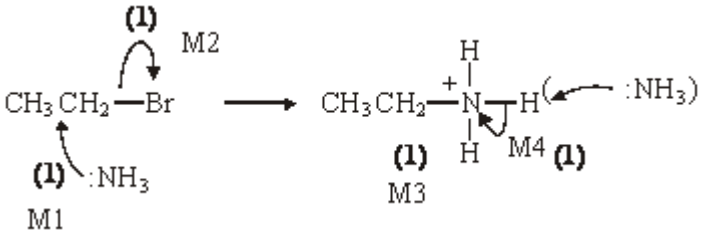
Lone pair <u>on N</u> less available

1

[10]

Q2.

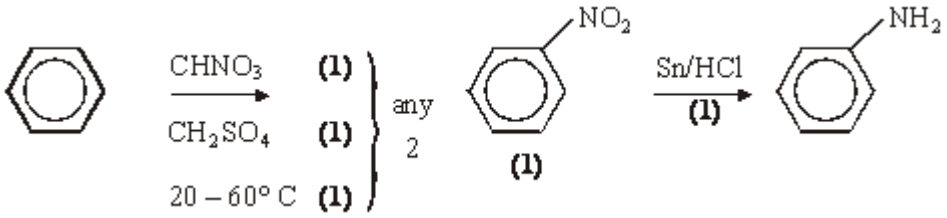
(a)



Further reaction / substitution / formation of 2° / 3° amines etc **(1)**
use an excess of NH_3 **(1)**

6

(b)  repels nucleophiles (such as NH_3) **(1)**



5

Notes

(a) allow S_N1
penalise: Br^- intead of NH_3 removing H^+ for M4
not contamination with *other amines* (this is in the question) not diamines

(b) allow because NH_3 is a nuclephile or benzene is (only) attacked by electrophiles
or C–Br bond (in bromobenzene) is stronger / less polar or Br lp delocalized

HNO_3 / H_2SO_4 without either conc scores **(1)** allow 20 – 60° for **(1)** (any 2 ex 3)

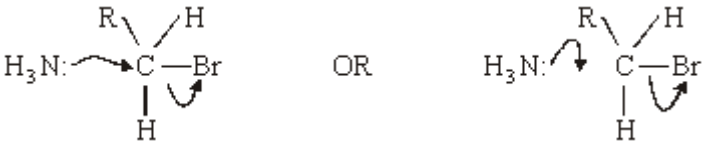
allow name or structure of nitrobenzene

other reducing agents: Fe or Sn with HCl (conc or dil or neither)
not conc H_2SO_4 or conc HNO_3
allow Ni/H_2
Not $NaBH_4$ or $LiAlH_4$
ignore wrong descriptions for reduction step e.g. hydrolysis or hydration

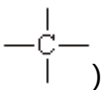
[11]

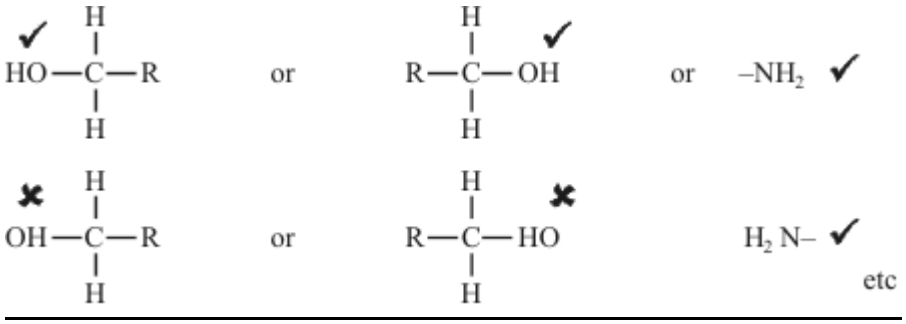
Organic points

(1) Curly arrows: must show movement of a pair of electrons,
i.e. from bond to atom or from lp to atom / space
e.g.



(2) Structures

penalise sticks (i.e. ) once per paper



Penalise once per paper

allow CH_3– or $–CH_3$ or  or CH_3
or H_3C–

Q3.

H CH_3CN or ethanenitrile **1**

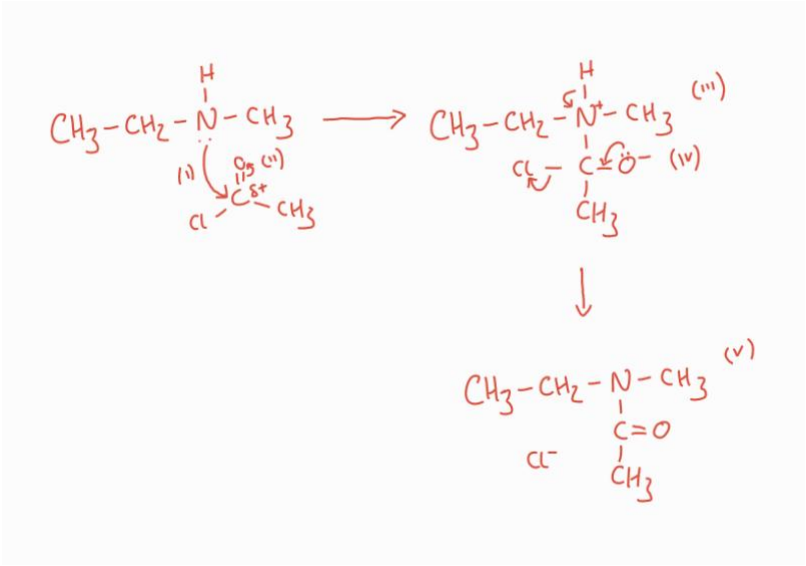
S $CH_3CH_2NH_2$ or ethylamine 1Step 1 KCN **1**

aq/alcoholic **1**

Step 2 H_2 **1**

Ni **1**

W secondary amine **1**



Curly arrow from lone pair to delta positive carbon **(1)**

Curly arrow from C=O bond to oxygen **(1)**

Structure of intermediate **(1)**

Curly arrows from lone pair on oxygen to carbon, curly arrow from C-Cl bond to Cl, curly arrow from N-H bond to N^+ **(1)**

Structure of product **(1)**

[9]