UNIVERSITÀ DEGLI STUDI DI MILANO

CONCORSO PUBBLICO, PER ESAMI, PER IL RECLUTAMENTO DI N. 1 UNITÀ DI PERSONALE AFFERENTE ALL'AREA DEI COLLABORATORI - SETTORE TECNICO, SCIENTIFICO, TECNOLOGICO, INFORMATICO E DEI SERVIZI GENERALI, CON RAPPORTO DI LAVORO SUBORDINATO A TEMPO INDETERMINATO PRESSO L'UNIVERSITÀ DEGLI STUDI DI MILANO - DIPARTIMENTO DI SCIENZE FARMACEUTICHE - CODICE 22474

La Commissione giudicatrice della selezione, nominata con Determina Direttoriale n. 12174 del 19/07/2024, composta da:

Prof.ssa Egle Maria Beccalli	Presidente
Prof.ssa Valentina Pirovano	Componente
Sig. Pietro Saquella	Componente
Dott.ssa Serena Pettenuzzo	Segretaria

comunica i quesiti relativi alla prova orale:

GRUPPO DI QUESITI N. 1

1. Individuare la seguente vetreria e strumentazione:

2. Correlare ciascun pittogramma con la frase corretta:

- Materiale esplosivo
- Gas sotto pressione
- Pericolo per l'ambiente
- Materiale corrosivo
- Irritante/Nocivo
- Rischio mutageno, respiratorio, cancerogeno e per la riproduzione
- Materiale Infiammabile
- Materiale comburente
- Tossicità acuta

3. Indicare la gestione e lo smaltimento dei rifiuti solidi in un laboratorio chimico.

4. Leggere e tradurre il seguente brano in inglese tratto da "Textbook of Practical Organic Chemistry by Arthur Israel Vogel":

IV,18. NITROBENZENE

$$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4} C_6H_5{\cdot}NO_2$$

Place 50 g (35 ml, *ca.* 0.5 mol) of concentrated nitric acid in a 500-ml round-bottomed flask, and add, in portions with shaking, 74 g (40 ml) of concentrated sulphuric acid. Keep the mixture cool during the addition by immersing the flask in cold water. Place a thermometer (110 °C range) in the acid mixture. Introduce 26 g (30 ml, 0.33 mol) of benzene in portions of 2–3 ml; shake the flask well, to ensure thorough mixing, after each addition of the benzene. Do not allow the temperature of the mixture to rise above 55 °C; immerse the flask, if necessary, in cold water or in ice-water. When all the benzene has been added, fit a reflux condenser to the flask and heat it in a water bath maintained at 60 °C (but not appreciably higher) for 40–45 minutes; remove the flask from time to time from the bath and shake it vigorously to ensure good mixing of the immiscible layers. Pour the contents of the flask into about 500 ml of cold water in a

624

GRUPPO DI QUESITI N. 2

1. Individuare la seguente vetreria e strumentazione:

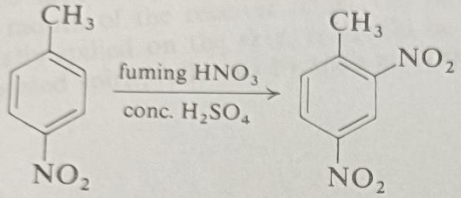
2. Correlare ciascun pittogramma con la frase corretta:

- Materiale esplosivo
- Gas sotto pressione
- Pericolo per l'ambiente
- Materiale corrosivo
- Irritante/Nocivo
- Rischio mutageno, respiratorio, cancerogeno e per la riproduzione
- Materiale Infiammabile
- Materiale comburente
- Tossicità acuta

3. Indicare la gestione e lo smaltimento dei rifiuti liquidi in un laboratorio chimico.

4. Leggere e tradurre il seguente brano in inglese tratto da "Textbook of Practical Organic Chemistry by Arthur Israel Vogel":

IV,21. 2,4-DINITROTOLUENE



Place 18 g (12 ml, *ca.* 0.36 mol) of fuming nitric acid, *d* 1.5, and 30 g (16.5 ml) of concentrated sulphuric acid and a few fragments of unglazed porcelain in a 250- or 500-ml round-bottomed flask contained in a fume cupboard. Add gradually, in small portions, 14 g (0.1 mol) of *p*-nitrotoluene; do not allow the temperature to rise above 50 °C and cool the flask, if necessary, by immersion in cold water. Place a small funnel in the mouth of the flask and heat on a water bath at 90–95 °C for 30 minutes. Allow to cool almost to the laboratory temperature and pour the reaction mixture slowly into about 500 ml of ice-water containing a few small pieces of ice. Filter the crude dinitrotoluene through a Buchner funnel at the pump, wash it thoroughly with cold water and drain as completely as possible. Recrystallise from the minimum volume of hot methanol (flask, reflux condenser and water bath). The yield of pure 2,4-dinitrotoluene, m.p. 71 °C, is 12.5 g (69%).

626

GRUPPO DI QUESITI N. 3

1. Individuare la seguente vetreria e strumentazione:

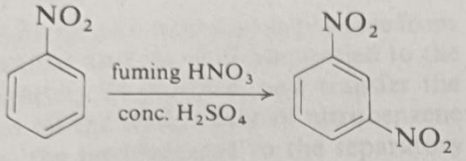
2. Correlare ciascun pittogramma con la frase corretta:

- Materiale esplosivo
- Gas sotto pressione
- Pericolo per l'ambiente
- Materiale corrosivo
- Irritante/Nocivo
- Rischio mutageno, respiratorio, cancerogeno e per la riproduzione
- Materiale Infiammabile
- Materiale comburente
- Tossicità acuta

3. Indicare come smaltire i rifiuti in un laboratorio chimico.

4. Leggere e tradurre il seguente brano in inglese tratto da "Textbook of Practical Organic Chemistry by Arthur Israel Vogel":

IV,20. *m*-DINITROBENZENE



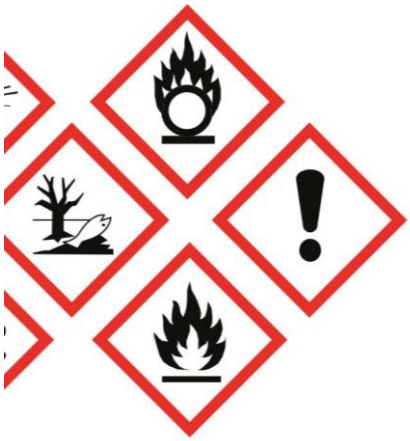
Place 37.5 g (21 ml) of concentrated sulphuric acid and 22.5 g (15 ml) of fuming nitric acid, *d* 1.5, in a 250- or 500-ml round-bottomed flask; add a few fragments of unglazed porcelain. Attach a reflux condenser and place the apparatus in a fume cupboard. Add slowly, in portions of about 3 ml, 15 g (12.5 ml, 0.122 mol) of nitrobenzene; after each addition, shake the flask to ensure thorough mixing. Heat the mixture, with frequent shaking, on a boiling water bath for 30 minutes. Allow the mixture to cool somewhat and pour it cautiously with vigorous stirring into about 500 ml of cold water; the dinitrobenzene soon solidifies. Filter with suction, wash thoroughly with cold water and allow to drain as completely as possible.

Transfer the crude dinitrobenzene to a 250-ml flask fitted with a reflux condenser, add 80–100 ml of industrial (or rectified) spirit and heat on a water bath until all the crystalline solid dissolves. If the resulting solution is not quite clear, filter it through a fluted filter-paper on a large funnel which has previously been warmed or through a warm Buchner funnel. Colourless crystals of *m*-dinitrobenzene (15 g, 73%) are deposited on cooling. If the m.p. is below 89–90 °C, recrystallisation is necessary.

GRUPPO DI QUESITI N. 4

1. Individuare la seguente vetreria e strumentazione:

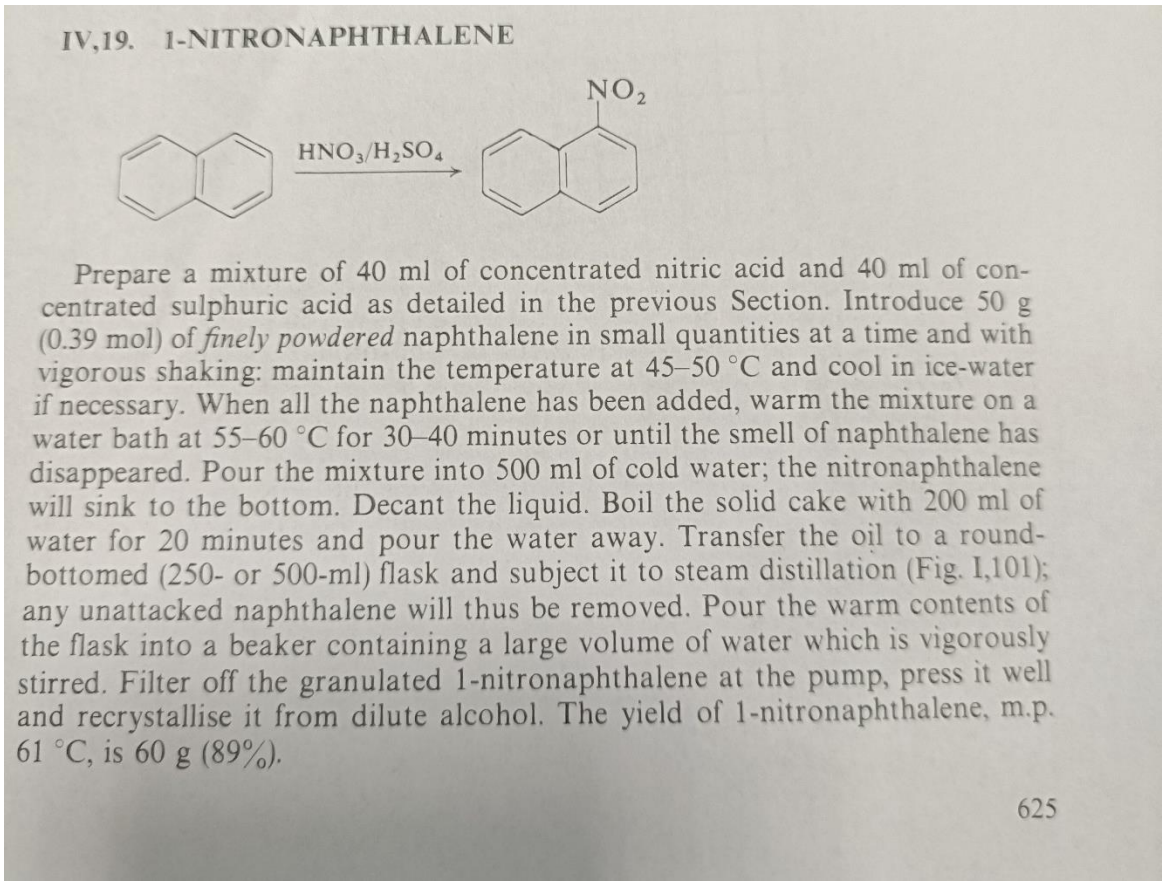
2. Correlare ciascun pittogramma con la frase corretta:



- Materiale esplosivo
- Gas sotto pressione
- Pericolo per l'ambiente
- Materiale corrosivo
- Irritante/Nocivo
- Rischio mutageno, respiratorio, cancerogeno e per la riproduzione
- Materiale Infiammabile
- Materiale comburente
- Tossicità acuta

3. Indicare quali possono essere i rifiuti in un laboratorio chimico.

4. Leggere e tradurre il seguente brano in inglese tratto da “Textbook of Practical Organic Chemistry by Arthur Israel Vogel”:



IV,19. 1-NITRONAPHTHALENE

Prepare a mixture of 40 ml of concentrated nitric acid and 40 ml of concentrated sulphuric acid as detailed in the previous Section. Introduce 50 g (0.39 mol) of *finely powdered* naphthalene in small quantities at a time and with vigorous shaking: maintain the temperature at 45–50 °C and cool in ice-water if necessary. When all the naphthalene has been added, warm the mixture on a water bath at 55–60 °C for 30–40 minutes or until the smell of naphthalene has disappeared. Pour the mixture into 500 ml of cold water; the nitronaphthalene will sink to the bottom. Decant the liquid. Boil the solid cake with 200 ml of water for 20 minutes and pour the water away. Transfer the oil to a round-bottomed (250- or 500-ml) flask and subject it to steam distillation (Fig. I,101); any unattacked naphthalene will thus be removed. Pour the warm contents of the flask into a beaker containing a large volume of water which is vigorously stirred. Filter off the granulated 1-nitronaphthalene at the pump, press it well and recrystallise it from dilute alcohol. The yield of 1-nitronaphthalene, m.p. 61 °C, is 60 g (89%).

625

Milano, 4 settembre 2024

La Commissione

Prof.ssa Egle Maria Beccalli Presidente

Prof.ssa Valentina Pirovano Componente

Sig. Pietro Saquella Componente

Dott.ssa Serena Pettenuzzo Segretaria