

## Assessment Questions MC07 Chemical Safety I

1. The toxicity of chemicals depends on how they enter the body (i.e., the "route of entry"). Which of the following is true?

- 1) The route of entry with the most severe consequence is inhalation
- 2) The route of entry with the most severe consequence is ingestion
- 3) The most frequent route of entry is inhalation
- 4) The most frequent route of entry is skin absorption

- a. 2) and 4)
- b. None of the above are true
- ☒ c. 1) and 4)
- d. 2) and 3)

2. Certain chemicals are classified as asphyxiants.

- 1) Only toxic gases like carbon monoxide are classified as asphyxiants.
- 2) Simple asphyxiant gases can displace normal breathing air and they are particularly hazardous in confined spaces.
- 3) Asphyxiation means preventing sufficient oxygen from being used by human body in order to sustain life.
- 4) Symptoms of asphyxiation (shortness of breath, headache, nausea, disorientation / confusion, muscular weakness, and loss of coordination) are not always recognizable and do not always occur in every person before they lose consciousness.

- a. All of the above are true
- b. Only 1), 3), and 4) are correct
- c. Only 1) and 2) are correct
- ☒ d. 2), 3) and 4) are correct

3. Which of the following statements about the Dangerous Goods Ordinance and Subsidiary Regulations (DG O&R) is/are true?

- 1) There are ten (10) separate categories of dangerous goods, and the materials from one category may be mixed with materials from another category for storage in the way that is most convenient to the user.
- 2) The Hong Kong Fire Services Department is responsible for the implementation of the DG O&R.
- 3) There are detailed requirements for using hazardous chemicals in laboratories in the DG O&R.

- ☒ a. All are true
- b. 2) and 3) are true
- c. Only 2) is true
- d. Only 1) is true

4. Carbon monoxide has certain unique hazard properties:

- 1) It is an easy hazard to recognize because of its distinctive odor;
- 2) It also has a flammable hazard with a Lower Explosion Limit of 12.5%;
- 3) Carbon monoxide binds with the hemoglobin in the blood and this action prevents normal oxygen transport by the blood;
- 4) Carbon monoxide does not bind to the hemoglobin in the blood as strong as oxygen.

- a. 1) and 3) are true
- b. 2) and 4) are true.
- c. 1) and 4) are true.
- ☒ d. 2) and 3) are true.

5. Systematic control of chemical hazards involves engineering controls, administrative controls, and personal protective equipment (PPE). Of these three categories:

- 1) Personal protective equipment (PPE) is the preferred choice of control since it has the greatest chance of protecting people;
- 2) PPE is the last choice because it is the "last line of defense";
- 3) Administrative controls are the preferred choice of control because they can prevent most problems by administrative authority;
- 4) Engineering controls are the preferred choice of control, because once they are in place, they function without the need for human decision making.

- ☒ a. Only 3) is correct.
- ☒ b. 2) and 4) are correct.
- c. Only 1) is correct.
- d. Only 4) is correct.

6. The Occupational Exposure Limit Time Weighted Average (OEL-TWA) refers to:

- a. The value that should not be exceeded during any part of the working day exposure.
- b. The value that should not be exceeded for longer than 15 minutes for more than 4 times per day.
- c. The value that should not be exceeded for more than 30 minutes during an 8 hour day.
- ☒ d. Airborne concentration of substances and the time weighted average concentration under which it is believed that nearly all workers may be repeatedly exposed for 8 hours per day and 40 hours per week without adverse effect.

7. Chemicals which are strong oxidizers can react in a rapid or even explosive manner. Protection from oxidizers can be achieved by:

- a. Minimizing the quantities prepared for each use.
- b. Proper storage, including separation from organic materials, flammable and combustible materials, bases, and reducing agents.
- c. Use of corrosion resistant containers.
- ☒ d. Removing unnecessary materials from the area of the experiment.
- ☒ e. All of the above.
- f. Only c. and d. above.



8. Protection from peroxide forming materials includes:

- a. Dating the chemical container with a receipt date at the laboratory.
- b. Dating the chemical container with an opened date.
- c. Dating the chemical with a disposal or retest date.
- d. Storing the chemical properly in an airtight container in a dark, cool and dry place.
- e. All of the above.

9. Some water-reactive chemicals react with water to yield flammable or toxic gases or other hazardous conditions. It is important that:

- 1) Chemicals like alkali metals (lithium, sodium, potassium, etc.) should be stored under kerosene or other oil;
  - 2) Fire protection should never include water as a fire extinguisher.
  - 3) Waste pieces should be cleaned quickly and placed into proper containers.
  - 4) Fine powders of these should always be dispersed in air within confined spaces.
- a. Only 1), 2), and 3) are true.  
b. All are true.  
c. Only 2), 3) and 4) are true.  
d. Only 2) and 3) are true.

10. Protection from cryogenic liquids can be achieved by:

- 1) Never tightly seal such liquids in any container without a pressure relief system.
  - 2) Always using pressure relief devices.
  - 3) Avoid working in a confined space with cryogenic liquids unless an oxygen alarm is present and in active use.
  - 4) Always work in a well ventilated area.
- a. None of the above.  
b. Only 4).  
c. 1), 2), 3) and 4).  
d. 1), 2) and 4).

11. Conventional fume hoods and ductless fume hoods are:

- a. Essentially the same, the ductless fume hoods are new products that do not require connection to building ventilation.
- b. Not the same, with different limitations requiring different user precautions and practices.
- c. Not the same, but users can apply the same practice in either type of hoods.

12. Proper usage of conventional fume hoods includes:

- 1) Always maintain sash at the highest possible position to allow easy access to inside of the hood
  - 2) Always maintain sash at the lowest possible position to ensure protection of user and save energy
  - 3) Adequate space should be left at the front and the back of the work area inside a hood to allow air to flow through.
  - 4) Always use the fume hood as a storage for volatile chemicals
- a. 2), 3) and 4)  
b. 1), 3) and 4)  
c. 1) and 4)  
d. 2) and 3)

13. When the "low flow" alarm of the fume hood is activated, the user should:

- a. Continue to use the fume hood and pay attention to see if the alarm will stop within 15 minutes.
- b. Call the campus emergency phone number 8999 immediately
- c. Stop using the fume hood and lower the sash, if the alarm does not stop in 15 mins, call FMO Building Services at 6465, if there is an emergency situation, call 8999
- d. Notify others in the laboratory and evacuate immediately

14. Which of the following statement(s) is/are correct for ductless fume hood usage:

- 1) Always maintain sash at the highest possible position to allow easy access to inside of the hood
  - 2) Always maintain sash at the lowest possible position to ensure protection of user
  - 3) Look out for filter saturation indicator or alarm
  - 4) Check the filter type before using a ductless fume hood to ensure it is suitable for the chemicals to be used.
  - 5) Always use the fume hood as a storage for volatile chemicals
- a. 1), 3) and 5)  
b. 2), 3) and 4)  
c. 1), 3) and 4)  
d. 2), 3), 4) and 5)  
e. 2) and 3) only

15. Under certain conditions, Personal Protective Equipment (PPE) can reduce exposure to harmful effects of chemicals.

- 1) With gloves, both proper fit and the correct choice of glove material for protection from specific chemicals are very important.
  - 2) All glove fabrics will NOT protect against all chemicals.
  - 3) Chemical protective gloves can be used indefinitely against chemicals without danger of breakthrough.
  - 4) Because of possible inconvenience, gloves should not be worn routinely for protection against exposure to chemicals.
- a. All of the above  
b. 1) and 2)  
c. 3) and 4)  
d. 1), 2) and 4)

16. Like all other PPE, gloves should be selected with consultation from health and safety staff. The selection criteria may include:

- a. User comfort is always the top priority in choosing PPE.
- b. The health and safety staff can provide guidance on choice of correct glove material for the specific chemical hazards of the workplace.
- c. Users of chemical protective gloves must know the limitation of gloves and should not have a false sense of security when handling hazardous chemicals.
- ☒ d. Only b. and c. are true.
- e. Only a. and b. are true.

17. For chemical safety, the first step is to evaluate the degree of hazard. The degree of hazard can be assessed by considering:

- a. The type of material and its toxicity;
- b. The nature and duration of the operation;
- c. The possible route of exposure.
- d. None of the above.
- ☒ e. a. b. and c.

18. In the field of toxicology, it is a well known statement that "The dose makes the poison". This means that

- 1) There are no "good" or "bad" chemicals
  - 2) All chemicals are toxic at some dose
  - 3) No chemical is toxic
  - 4) An LD<sub>50</sub> of 100 mg/Kg differentiates poisonous and non-poisonous chemicals
- ☒ a. 1) and 2)
  - b. 1) and 3)
  - c. 2) and 4)
  - d. 1), 2) and 4)

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## Assessment Questions

### MC03 Chemical Safety II

#### 1. Chemical Waste

- a. is not considered important in Hong Kong.
- b. does not affect the common citizen.
- ☒ c. is defined by Hong Kong law in the Waste Disposal (Chemical Waste) Regulation enacted in 1992.
- d. is only important in the nuclear industry.

#### 2. The Chemical Waste Control Scheme in Hong Kong :

- a. is only an idea from the EPD.
- ☒ b. carries significant financial penalties and imprisonment for violation of the law.
- c. will become effective in 2015.
- d. is advisory in nature and does not include enforcement actions.

#### 3. Hazardous waste management practice by HSEO at HKUST:

- a. provides delivery of the appropriate container(s) to the client lab.
- b. provides pickup of the full (75% of capacity only) waste containers.
- c. maintains records of the waste for EPD inspection.
- ☒ d. all of the above are true.

#### 4. Chemical waste must always be safely transferred to the waste container.

- a. Waste generators should select the correct waste container and check the waste log sheet to verify compatibility of a new waste with the contents of the waste container.
- b. Perform the compatibility test if there is any concern about a possible reaction between new waste and old waste already in the container.
- c. Carefully pour chemical waste into the waste container.
- ☒ d. All of the above are true.

#### 5. It is important that the pH of cyanide waste solutions be made:

- a. acidic (i.e., <7.0).
- ☒ b. strongly alkaline (>7).
- c. the pH is not important.
- d. acidic with sulfuric acid only.

#### 6. It is an important practice to complete the Chemical Waste Log Sheet:

- a. after the waste is picked up by HSEO.
- b. just before HSEO comes to pick up the waste.
- ☒ c. after each addition to the waste container.
- d. when the waste is taken to Tsing Yi Island by Ecospace.

#### 7. Which of the following is/are common chemical waste problem(s)?

- a. Mixing of incompatible wastes causing violent chemical reaction.
- b. Users did not check liquid level and overfilled containers.
- ☒ c. Users did not fill out chemical waste log sheet immediately.
- ☒ d. All of the above.

#### 8. If you have a bottle of unopened chemical reagent that you no longer need, the first thing you should do is

- a. Dispose the whole bottle through the Lab Pack program.
- b. Open the bottle and transfer the chemical to a suitable chemical waste container.
- c. Pour the chemical down the sink and dilute with plenty of water.
- ☒ d. Post the chemical on the Chemical Exchange Program webpage so that other users may get and use the chemical.

#### 9. At HKUST, the chemical user

- ☒ a. is responsible to safely put their own liquid waste into the waste container.
- b. bears no responsibilities for their own hazardous waste.
- c. can rely on the department safety officer to dispose of their chemical waste.
- d. can call CLS for removal of hazardous waste.

#### 10. At HKUST, the chemical user

- a. should not be concerned with the condition of the waste container.
- ☒ b. should carefully inspect each waste container before using it.
- c. does not have to use a waste container.
- d. can discard all chemicals down the drain.

#### 11. Chemical waste storage practice:

- a. should include use of a spill tray or some spill containment procedure.
- b. should include storage of flammable waste in flammable cabinets.
- c. must display a "chemical waste" sign in both Chinese and English.
- ☒ d. all of the above.

#### 12. Waste minimization includes

- a. careful estimation of future requirements for chemicals.
- b. buying chemicals in container sizes appropriate to actual use.
- c. reducing chemical inventories to a minimum.
- ☒ d. exchange of unwanted chemicals.
- ☒ e. all of the above are true.



13. Which of the following is/are NOT chemical wastes according to the Waste Disposal Regulation & EPD guidelines:

- i. Apparatus rinsing water, wiping tissues.
- ii. Elemental metals not listed in Appendix A (e.g., copper, iron, tin, zinc).
- iii. Household chemicals used in laboratories.
- iv. Diluted acid and alkalis with concentration less than those listed in Schedule I of the Waste Disposal (Chemical Waste) (General) Regulation.
- v. Non-halogenated organic solvent.

- a. i only.
- b. i and ii.
- c. iv. and v.
- ☒ d. i., ii., iii. and iv.

14. The basic responses for any hazardous material spill are

- ☒ a. Alert others, activate Emergency Ventilation if necessary.
- b. Leave the scene immediately.
- c. Always cleanup the spilled chemical.
- d. Seal off the area.
- e. Get help.
- f. a., b., d. and e.
- g. All of the above.

15. First aid for hydrofluoric acid burns should consist of at least the following steps.

- a. Immediately flush the affected skin area with large quantities of water.
- b. Continue flushing of the burn area for up to five minutes.
- c. Apply calcium gluconate gel (2.5-3%) to the burn site by rubbing it in continuously (while wearing HF impervious gloves, such as PVC).
- d. Always seek examination and treatment by a physician as soon as possible (ASAP)
- ☒ e. All of the above.

16. Hazardous waste containers from Ecospace are recycled continuously and should be treated with caution:

- a. The user should inspect each container carefully upon receipt, looking for cracks or other signs of damage that could lead to leakage.
- b. The user should inspect the handle carefully and be sure that it is not damaged or weakened in any obvious way.
- c. Containers should only be filled up to 75% of capacity, and full containers should be lifted/moved carefully to avoid physical strain to the employee, or drop damage to the container.
- d. Unsafe containers should be reported to HSEO.
- ☒ e. All of the above are correct.

17. Transferring chemical waste to a waste container should be considered a potentially hazardous operation:

- a. Always use appropriate personal protective equipment (PPE) when handling waste, including face shield, gloves, laboratory coat, and a respirator (if appropriate).
- b. A fume cupboard should be used when waste with hazardous vapors is added to the waste container.
- c. Before any new chemical is added to the waste container, the responsible person should review the waste container contents via the log sheet, and perform the compatibility test if appropriate.
- d. All chemical waste transfers should be done in the presence of a Hong Kong Fire Services Department (FSD) officer.
- ☒ e. a., b., and c. are correct.
- f. Both b., and d., are correct.

18. The Emergency Ventilation system should be activated immediately when :

- i. there is a spill of volatile or toxic chemicals.
- ii. there is an unknown smell.
- iii. the room temperature is abnormally high.
- iv. there is a fire.

- ☒ a. i only.
- b. i., ii. and iv.
- c. i and ii.
- d. i., ii., iii. and iv

19. Which of the following nanomaterials presents a potential hazard to laboratory workers, through both inhalation and skin exposure?

- i. quantum dots made of Cd and Se in aqueous solution.
- ii. Formed nanocomposite containing nano-size  $\text{CaCO}_3$  as an ingredient.
- iii. Synthetic zeolite containing nano-size pores.
- iv. Nano-size  $\text{TiO}_2$  particles.

- a. All of the above.
- ☒ b. ii and iv.
- c. i and iv.
- d. iii and iv.
- e. iv only.

20. Which of the following is NOT a recommended precautionary measures for nanomaterials?

- a. Use HEPA filtration for airborne nanomaterials.
- b. Use local exhaust ventilation to capture and contain airborne nanomaterials.
- c. Wear gloves that are at least protective against the carrier solvent for nanomaterials in solution.
- d. Dispose waste nanomaterials as chemical waste.
- e. All of the above are recommended precautionary measures for nanomaterials.