Introduction

This document is intended to help course tutors in briefing their students on the Short Answer Question (SAQ) examinations and there are some example questions that can be used during the course.

Examination Conditions

For examinations the room must be configured so that each candidate is able to work alone without observing or interfering with colleagues. A floor area of at least $1.5m^2$ per candidate must be provided and the examination room must be at a comfortable temperature, adequately ventilated and free from distracting noise.

For open book examinations candidates may have access to course notes, handouts or any associated course documentation. These are not allowed for closed book examinations.

Candidates are not allowed to use laptop/palmtop computers, mobile phones, or any device which allows communication in any examination room.

Instructions to Candidates

This set of information is on the front of every candidate examination booklet, but tutors should themselves be aware of the instructions, and explain them to candidates before the examination. [The text in italics has been added to help tutors in their pre-briefing of candidates.]

- Candidates are advised that for each question they are required to write the answer in the box provided either as a complete sentence or as bullet point(s). It is not expected that the candidate would need more space for the answer than the box provides.

All examination papers are checked to ensure that they normally match the balance and content of the syllabus.

Candidates are not required to write large quantities of text; rather they should give a brief answer which can be as bullet point(s).

Some questions will require the candidate to make deductions and or calculations.

- Each question is worth a total of four marks.

Four marks are allocated to each question. In some cases there is a single answer which will gain the full four marks. In most cases, the marks will be split amongst the answer options; this could be in divisions of half a mark, one mark, or two marks, or in some cases a basic answer can be awarded two or three marks and supplementary answers or correct calculation methodology can make up the full four mark allocation. Therefore it is possible for nil, one, two, three or four marks to be awarded for an answer. [It is also possible to get half a mark, one and half marks, etc.] The overall marks for the paper are used to assess the candidate’s performance. Where results are marginal then automatic quality assurance procedures are initiated which include, when appropriate, remarking of the whole paper.
- All questions should be attempted.

_The examination timing is designed for an average of three minutes per question. It is expected that well-
prepared students who have attended the course and put in the recommended study time will have adequate
time to answer the questions within the allotted time allocation for the paper._

- No marks will be deducted if a wrong answer is given.

_There is NO negative marking. An attempted answer might gain some marks so all questions are worth
attempting. However, full marks will not be awarded for ‘hedging bets’ – e.g. where a candidate lists multiple
answer options when a specific answer is required, or a specific number of answers is required._

- Marks are neither gained nor lost if the question is not answered.

_It is therefore worth trying to answer all questions._

- Rough work outside the box will be ignored.

_This does not mean that answers which stray outside the box will not be considered! In addition, when
questions require calculations, the student should show their calculations - they will gain some marks if they
use the correct method of calculation even if their answer is incorrect._

- Complete and sign the Candidate Information form.

_This is compulsory as part of the security and identity system._

- Complete the front cover of the examination paper with name and the date of the examination.

_This is to ensure that candidates’ answers are retained with their identity._

- If you have a query regarding a question, please make your comments on the examination paper, _not_
to the invigilator or course tutor.

_All comments on examination papers are reviewed and where appropriate, action is taken._

- Electronic calculators are permitted, but programmable calculators/personal computers are NOT.

_Please ensure that the candidates are familiar with the calculators that they are using. On some courses
candidates have been unable to use the calculators provided for the exam since the operating functions
differed from those of their personal calculator._

- All mobile telephones must be switched off before the examination commences and not switched on
again until the examination has finished. Anyone found using their telephone during an examination
will be disqualified without appeal.

_Individual invigilators, at their own discretion, may request all mobile telephones to be handed in during the
period of the examination._

_At the end of the examination the invigilator is required to collect all loose sheets of paper, exam
notes etc. from all the candidates._
Short Answer Questions (SAQs)
Example Questions with Marking Schedule

In order for Training Providers to better understand the SAQ style and how they are marked, a few examples are given below. Please note that these are examples only, they do not necessarily reflect the most up-to-date subject technical guidance, and are unlikely to appear in actual examinations. The number in parenthesis (eg. [2]) indicates the number of marks for that question/part of the question. The examples cover the range of Occupational Hygiene and Proficiency Modules currently available, and are not presented in any particular order.

The appendix to this document contains many more example questions in the short answer series that may be used by tutors as overnight test questions during the course to allow student more experience at this style of question.

1) Explain why wetting with a water spray is not a suitable control method when removing sealed asbestos lagging.

   Should use an injection system to ensure complete wetting throughout the whole lagging before removal [2] spray wetting only wets the exposed surface [2]

2) Give an example of a primary standard used for the calibration of sampling pump or working rotameter for flow rates in the field.


3) What is the Walton and Beckett graticule used for when using phase contrast microscopy for the detection of asbestos?

   Walton Beckett graticule is used for fibre counting microscope set up [3] to assess the size of fibres [1]

4) Which form of asbestos is more prevalent in Asbestos insulating board (AIB), used as ceiling tiles?

   Amosite [4] correct answer given as one of two options [2] correct answer given as one of three options [1] correct answer given as one of more than three options [0]

5) According to HSE Guidance Note HSG247 how many air changes per hour should be provided by the negative air pressure unit on an asbestos enclosure?

   8 [4]

6) As an analyst what action should be taken if an air test outside a stripping enclosure reaches an exposure level of 0.03 f/ml during work?


7) What is mesothelioma?


8) The effects of asbestos and tobacco smoke are said to be synergistic. What does this mean?

   Working together [2] to more greatly elevate the risk of disease [1] (lung cancer) than the two agents would pose individually [1]
9) Describe a technique that can be used to visualise dust or aerosol particulate material in the air.

    Use of a dust lamp or equivalent bright beam of light shone through the area where it is thought a particle cloud may be present [2]. The particles present diffract the incident light [1] and an observer looking up the beam to the source of the illumination (at an angle of about 5 – 15°) can see the dust particles [2]. [Maximum 4]

10) What is the reduction in inward flow velocity at one duct diameter from a non-flanged captor hood, compared with the face velocity?

    The velocity at one duct diameter in front of the hood will be less than 10% of that achieved at the face [4] or 10 to 15% [2]. [Maximum 4]

11) What happens to the air flow in a duct when the direction of rotation of a centrifugal fan is reversed?

    It will be in the same direction [2] but the characteristics will change [2] flow reduced [1]. [Maximum 4]

12) What are the main reasons for installing an air cleaner in a local exhaust ventilation system?

    Compliance with environmental legislation [2] preventing contaminated air re-entering the workplace [2] economic considerations such as the recovery of expensive material [1]. [Maximum 4]

13) Why should weather caps and cowls be avoided on external discharges of LEV systems?

    They create a large resistance to airflow [1] reducing the efficiency of the system [1] and prevent contaminants being dispersed [2]

14) What equipment/instruments can be used to assess the performance and face velocity of a small ventilated booth?


15) What is the most suitable filter type for sampling airborne oil mist?


16) Using the OSHA model, what is the adjustment to the long-term exposure limit for workers who routinely work 12 hour shifts?

    Exposure limit value X 8/12 [4]

17) Using the data below calculate the average dust concentration over the period of sampling.

    Amount of dust collected = 0.73mg
    Sampling pump flow rate = 2.1 litres per minute
    Sampling time = 7 hours and 10 minutes.

    [Calculation: 430 mins @2.1 litres/min = 903 litres or 0.90 m³]

    0.73/0.90 = 0.81 mg/m³

    0.81 mg/m³ [4] correct answer with no units [3] incorrect answer but correct method [up to 2]
18) Calculate the 8-hour time-weighted average exposure to xylene vapour of a worker who spends 45 minutes each day at an operation where the concentration is 232 ppm, 4.5 hours on an operation where the concentration is 47 ppm, and 5.25 hours on an operation where the concentration is 5 ppm.

\[
\text{Calculation: } [232 \times 0.75] + [47 \times 4.5] + [5.25 \times 5]/8 = 51.5 \text{ ppm}
\]

44.9 ppm [4] correct answer with no units [3] incorrect answer but correct method [up to 2]

19) Why are blank control samples and filters from air sampling dust placed in clean labelled tins or Petri dishes and left with the lids slightly ajar in the balance room overnight before being weighed?

Filter papers absorb moisture [2] therefore it is necessary to ensure that samples and controls are all at equilibrium with the humidity of the room [2]

20) At a work activity where there are currently no control measures in use, an employee’s exposure to an asthmagen [an agent that can cause occupational asthma] with an occupational exposure limit of 5 g/m³ is measured at 4 μg/m³. Does anything need to be done and if so, why and what?

Yes [1] asthmagens do not have a no effect level [2] so exposure needs to be reduced initially by RPE [1] followed by engineering controls if possible [1] [Maximum 4]

21) In a small workshop the background noise level in the area is 81 dBA. A new pump with a declared operating noise level of 76 dBA is to be introduced. What is the expected overall noise level in the workshop when the pump is operating?

For 81 and 76, the difference is 5, the difference of 5 leads to 1.0 addition to the higher level. Therefore 81+1.0 = 82 dBA [4] Incorrect answer correct method [up to 2]

22) The noise levels from three separate machines in an area are 79, 82 and 85 dBA. What is the expected overall noise level when all three machines are running together?

Adding the noise levels in pairs – 79 + 82 gives a total of 84 dBA, 84+85 gives a total of 87.5 dBA. Correct answer [4] incorrect answer correct method [up to 2]

23) Why is the A weighting network normally used when assessing risks from exposure to noise?

The A weighting is a frequency filter [2] that has a similar response to the frequency response of the human ear [3] [Maximum 4]

24) The sound level of one machine is 89 dBA. A second, identical machine is added next to it. The resulting sound level when both machines are running is:

92 dBA [2 sources +3] [4]

25) What is the main reason for substituting toluene di isocyanate (TDI) with methylene di isocyanate (MDI)?

MDI has a much lower vapour pressure at room temperature [4] and therefore releases less vapour than TDI [4] [Maximum 4]

26) What is the most common toxic pyrolysis product of chlorinated hydrocarbons?

Phosgene [4] correct answer given as one of two options [2] correct answer given as one of three options [1] correct answer given as one of more than three options [0]

27) What is the critical health effect which forms the basis for setting the Exposure Limits for n-hexane?

Peripheral neuropathy [4]
28) Define the two types of vibration exposure of concern in occupational ergonomics, and give an example of a likely cause of each type.

Hand transmitted vibration [1] – through use in hand held power-tools [1]

Whole body / shaking / jolting the whole body through a supporting surface [1] - through driving machinery [1] particularly over rough ground [1] [Maximum 4]

29) List four protective functions provided by the skin.


30) List the four minimum ergonomic requirements for a typical office VDU workstation.

Screen – adjustable [1] for position, brightness and colour [1] [Maximum 1]

Seat – stable [1] and adjustable [1] [Maximum 1]

Keyboard – suited to the operator [1], adjustable [1] [Maximum 1]

Work surface – sufficient space [1] allows personal variation in equipment location [1] [Maximum 1]

[Maximum 4]

31) When making an environmental assessment of an indoor workplace, which two measurements are required to calculate the WBGT index of that workplace?

Natural or un-aspirated wet bulb [2] and globe temperature [2]

32) What is a typical clo value range for polar clothing?

3-4 [4] anything from 2-6 [2]

33) Which occupational skin disease is the most common in industrial workers?

Contact dermatitis [4]

34) What is the recommended work/rest regime for heavy work at 30°C WBGT?

25% work/75% rest per hour [4]

35) What are heat cramps caused by?

Loss of body salt in sweat [4]
APPENDIX

The lists below are examples of questions which course providers may wish to use during their course as examples of the many types of questions that the candidates will face in the actual examination.

We have not provided example answers to these questions so that we may, if we wish, use these questions or similar questions in the actual examination papers.

1.0 Asbestos

1. How long before carrying out the work must a company being employed to strip sprayed asbestos from a workplace inform the enforcing authority of the proposed activity?

2. To comply with the Control of Asbestos Regulations 2012 how often should respirators used in asbestos stripping be thoroughly examined and tested?

3. According to HSE Guidance Note HSG 248 before clearance air sampling takes place in an enclosure what should be done to the negative pressure unit?

4. How frequently should a negative pressure unit be thoroughly examined and tested?

5. As a building manager, the analyst covering a removal job advises you that the method statement is significantly different from the work actually carried out. What action would you expect the analyst to take?

6. When removing asbestos what personal protection would you expect to be wearing?

7. At the start of an asbestos removal job as a Supervisory License Holder what would you want to be done first?

8. What could be used to provide a primary calibration for a working rotameter?

9. When carrying out sampling to assess the adequacy of respiratory protection inside an asbestos stripping enclosure, according to HSG 248, where should the sampling head be located?

10. Apart from the pre-filter, why should the negative pressure unit be located outside an asbestos stripping enclosure?

11. When conducting an asbestos clearance inspection in a boiler house, traces of asbestos debris are discovered around bolt heads on valve flanges. What would be the most appropriate action?

12. Visual inspection of an enclosure revealed that asbestos removal work has been completed but with no dust or debris remaining. However, the clean end of the three stage airlock has some dust on the floor. What action should the analyst from the asbestos testing laboratory take?

13. What standard would be applied to respiratory protection equipment used by an analyst entering an enclosure for monitoring as stage 3 of the four stage clearance procedure?

14. As an analyst carrying out four stage clearance you find that the enclosure has been sprayed down with a PVA material. What would you do?

15. According to HSE guidance what factors need to be taken into consideration in calculating a material assessment?

16. Whilst carrying out a survey you need to take samples from a tar and felt roof. What sampling frequency would you observe?
17. What is the typical concentration of asbestos fibre found in textured coatings?

18. Define/explain the purpose of a Management Asbestos survey?

19. Which is the preferred method for taking a sample from asbestos cement roofing sheet?

20. Additional sampling during a Management survey establishes that a wall board panel does not in fact contain asbestos. Give the most likely potential reason for the original error.

21. What is the purpose of the material assessment algorithm as defined by HSG 264?

22. According to HSG 264 when is information required for a risk assessment to be collected?

23. What is the initial starting point in a priority assessment algorithm for a survey of Asbestos containing materials in premises?

24. What action should be taken where there is evidence in the form of particulate on the floor beneath sprayed asbestos on steel work at high level?

25. What action should be carried out by a building manager where an electrician is required to access the void above a suspended ceiling of asbestos tiles in good condition for 15 minutes?

26. What are the options that could be taken during a management asbestos survey, where an asbestos label is found attached to a piece of wooden plywood boarding in an office?

27. Which asbestos material could legitimately be found used in buildings constructed between 1996 and 1998?

28. When carrying out a refurbishment and demolition survey in accordance with HSG264. If no access is available into a room or area what should the surveyor report?

29. What asbestos fibre type would be determined, if it is observed as showing a feint yellow-brown pleochroism, straight extinction, 2nd order interference colours, length slow sign of elongation and dispersion staining colours in RI liquid of 1.67?

30. What is the most likely treatment that Crocidolite has received if it is exhibiting positive (length slow) elongation?

2.0 Legionella

1. How do people catch Legionnaires’ disease?

2. Give two examples of how the disease may be medically confirmed.

3. Why might Legionella tend to proliferate in the base of a hot water storage vessel?

4. Why are mains fed electric showers generally considered to be a lower risk than mixer showers?

5. It is recommended that multiple cold water tanks are connected in series. What are the possible consequences of operating multiple tanks that are connected in parallel?

6. Which would be of more concern: water at 28°C in a clean tank, or water at 18°C in a rusty tank? Justify your answer

7. Is legionnaires' disease notifiable in England and Wales? Is there any required reporting?
8. How quickly must changes to the details required by the Notification of Cooling Towers and Evaporative Condensers Regulations be reported?

9. What is the principal function of a granular filter such as a sand filter in a cooling tower or evaporative condenser system?

10. Give two advantages of disinfecting a cooling tower system at a low chlorine concentration for a longer period, rather than at a high concentration for a shorter period.

**3.0 Ergonomics**

1. What is the definition of the term ‘anthropometry’ and what is its purpose?

2. Name the main factors that contribute to the gender differences in strength?

3. Describe the main methods by which work tasks can be redesigned to enhance a human’s endurance in carrying out these tasks?

4. Describe the criteria that can be used to ensure information presented to a person is compatible with their perceptual abilities.

5. What is the purpose, advantages and disadvantages of the technique of timeline analysis?

6. Give an example of an “engineering control” and how it can be used to reduce risk?

7. Why should an analyst NOT assess manual handling risk by carrying out the manual handling work themselves?

8. What ergonomic factors should be considered in defining the intended size of a workspace?

9. What issues should be considered in the safe design of walkways and stairs?

10. What design features of a workstation need to be considered in accommodating the user?

**4.0 Control**

1. Describe a technique to visualize dust or aerosol particulate material in the air?

2. List the main elements of the hierarchy of control and the order of preference for the different measures.

3. In a non-flanged captor hood, what is the approximate inward flow velocity reduction with distance?

4. When a Centrifugal fan has its direction of rotation reversed, what happens to the air flow in the duct?

5. What are the main reasons for installing an air cleaner in a local exhaust ventilation system?

6. List four methods that can be used to evaluate the efficiency of local exhaust ventilation systems

7. For what reasons should weather caps and cowls be avoided on external discharges?

8. What equipment/instruments should be used to assess the performance and face velocity of a small ventilated booth?

9. The potential for exposure to airborne contaminants for maintenance personnel is typically greater than for non-maintenance personnel because:

10. What is the effect of fitting a flange to an extract duct?
5.0 Measurement of Hazardous Substances

1. What is the most suitable medium for sampling airborne oil mist?

2. Employees who routinely work 10-hour shifts are exposed to a substance, which has a long-term exposure limit. What multiplier of measured exposures should be adopted for comparison with the 8-hour long-term exposure limit?

3. From which welding process will the fumes produced contain the greatest percentage of hexavalent chromium? (Cr V1)

4. A sampling pump was run at 2.2 litres per minute for 5 hours 45 minutes. The amount of respirable dust collected was 0.42 mg. What is the average airborne dust concentration over the sampling period?

5. Why does cadmium oxide fume have a very low short-term exposure limit?

6. Following an air sampling survey for trichloroethylene (occupational exposure limit 100 ppm 8-hour time-weighted average) as part of a routine annual air monitoring programme, eight out of ten results are less than 50 ppm, one is 70 ppm and one is 115 ppm. What conclusions can be drawn and why?

7. Calculate the 8-hour time-weighted average exposure to xylene vapour of a worker who spends 30 minutes each day at an operation where the concentration is 200 ppm, 5 hours at 50 ppm, and 5 hours at 10 ppm.

8. Why are blank control samples and filters from air sampling dust placed in clean labelled tins or Petri dishes and left with the lids slightly ajar in the balance room overnight before being weighed?

9. At a work activity where there are currently no control measures in use, an employee’s exposure to an asthmagen with an occupational exposure limit of 5 μg/m³ is measured at 4 μg/m³. Does anything need to be done and if so what?

10. The exposure of a worker to respirable dust was measured during a series of operations. What is the time-weighted average dust exposure during the course of the day?

<table>
<thead>
<tr>
<th>Operation</th>
<th>Duration</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 hr 15 mins</td>
<td>0.20 mg/m³</td>
</tr>
<tr>
<td>2</td>
<td>3 hours</td>
<td>0.04 mg/m³</td>
</tr>
<tr>
<td>3</td>
<td>2 hrs 45 mins</td>
<td>0.05 mg/m³</td>
</tr>
<tr>
<td>4</td>
<td>30 mins</td>
<td>0.30 mg/m³</td>
</tr>
<tr>
<td>5</td>
<td>30 mins</td>
<td>0.65 mg/m³</td>
</tr>
</tbody>
</table>

11. Workers are engaged in paint spraying using polyurethane paint containing Isocyanate (a respiratory sensitiser). A high degree of control, including respiratory protection is in place. What additional testing should be carried out to provide evidence of the continuing effectiveness of control measures?

12. What air sampling strategy should be adopted for the evaluation of exposure to Cadmium Oxide fume (WEL 0.05 mg/m³ 8-hr TWA, 0.05mg/m³ 15-min STEL)?

13. What is the main purpose of fixed location static samplers?

14. When sampling for airborne asbestos fibres, what filter should be used for the standard method of microscopic evaluation?

15. Automatic continuous monitoring of sulphur dioxide gas is best carried out using which technique?
16. List two methods for detection used in Gas liquid chromatography.

17. Which external quality control scheme is concerned with asbestos fibre counting?

18. For a substance hazardous to health with a ‘Sk’ notation in HSE Guidance Note EH40 'Workplace Exposure Limits', what would be the route of entry into the body?

19. What biological index is used normally used for the biological monitoring of exposure to inorganic mercury?

20. Several dust filters are weighed before and after air sampling. Along with these filters, three ‘blank’ filters are also weighed. What is the weight of dust on sample filter 1, corrected for the average weight change of the blanks?

<table>
<thead>
<tr>
<th>Filter</th>
<th>Weight before (mg)</th>
<th>Weight after (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample filter 1</td>
<td>26.137</td>
<td>27.087</td>
</tr>
<tr>
<td>Blank filter 1</td>
<td>25.136</td>
<td>25.143</td>
</tr>
<tr>
<td>Blank filter 2</td>
<td>26.584</td>
<td>26.595</td>
</tr>
<tr>
<td>Blank filter 3</td>
<td>26.254</td>
<td>26.257</td>
</tr>
</tbody>
</table>

6.0 Noise

1. Five sound sources generate the following noise levels in dB(A) at a listener's ear: 92, 88, 86, 93, 81 dB(A). What is the total noise level (to the nearest dB(A)) when they all occur at the same time?

2. If a frequency analyzer used for measuring vibration has been set up so that 1 g (9.81m/s²) is equivalent to 0dB, what does a value of 20dB higher relate to?

3. A person is exposed to 75 dB(A) for 3 hours, 84 dB(A) for 2 hours, 90 dB(A) for 1 hour and 93 dB(A) for 2 hours. This is equivalent (approximately) to an exposure for 8 hours of:

4. A centrifugal fan has 40 blades, and rotates at 1500 rpm. Which predominant frequency would be expected to be found in the noise produced?

5. What is the most accurate and easy way to assess a complicated noise exposure that consists of a series of different noise sources experienced over a period of time?

6. When constructing a noise enclosure for a plastics grinding machine what are the preferred materials for the enclosure panels?

7. In the course of an environmental noise investigation in accordance with BS4142 a dominant noise source operates for 15 minutes per hour during the daytime only. If the LaeqTm = 56 dB(A), what is the daytime specific noise level?

8. What is the physical principle on which the accelerometer depends for the measurement of vibration?

9. In what units should the magnitude of vibration for assessment of hand held tool be expressed as?

10. What is the main benefit of wearing anti-vibration gloves?
7.0 Thermal Environment

1. In a room admitting sunlight through a window, what is the air temperature determined by?

2. The uptake of oxygen at 1 litre per minute is equivalent to approximately what level of metabolic rate (in watts)?

3. When assessing heat stress using the Wet Bulb Globe Temperature Index, apart from natural wet bulb, globe and dry bulb temperatures, what other parameters are considered when assessing work/rest regimes?

4. What two relationships are described on a psychrometric chart?