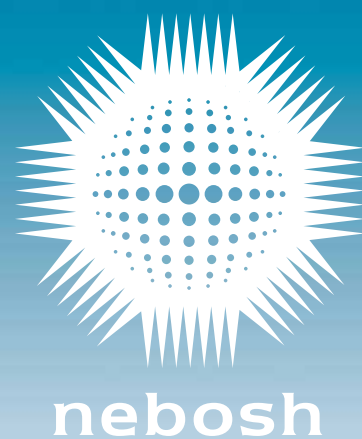


July 2013

Examiners' Report

NEBOSH National Diploma in Occupational Health and Safety - Unit B



Examiners' Report

NEBOSH NATIONAL DIPLOMA IN OCCUPATIONAL HEALTH AND SAFETY

Unit B: Hazardous agents in the workplace

JULY 2013



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Introduction

NEBOSH (The National Examination Board in Occupational Safety and Health) was formed in 1979 as an independent examining board and awarding body with charitable status. We offer a comprehensive range of globally-recognised, vocationally-related qualifications designed to meet the health, safety, environmental and risk management needs of all places of work in both the private and public sectors. Courses leading to NEBOSH qualifications attract around 35,000 candidates annually and are offered by over 500 course providers, with exams taken in over 100 countries around the world. Our qualifications are recognised by the relevant professional membership bodies including the Institution of Occupational Safety and Health (IOSH) and the International Institute of Risk and Safety Management (IIRSM).

NEBOSH is an awarding body to be recognised and regulated by the Scottish Qualifications Authority (SQA).

Where appropriate, NEBOSH follows the latest version of the “GCSE, GCE, *Principal Learning and Project Code of Practice*” published by the regulatory authorities in relation to examination setting and marking. While not obliged to adhere to this code, NEBOSH regards it as best practice to do so.

Candidates’ scripts are marked by a team of Examiners appointed by NEBOSH on the basis of their qualifications and experience. The standard of the qualification is determined by NEBOSH, which is overseen by the NEBOSH Council comprising nominees from, amongst others, the Health and Safety Executive (HSE), the Confederation of British Industry (CBI), the Trades Union Congress (TUC) and the Institution of Occupational Safety and Health (IOSH). Representatives of course providers, from both the public and private sectors, are elected to the NEBOSH Council.

This report on the examination provides information on the performance of candidates which it is hoped will be useful to candidates and tutors in preparation for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content and the application of assessment criteria.

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Any enquiries about this report publication should be addressed to:

NEBOSH
Dominus Way
Meridian Business Park
Leicester
LE19 1QW

tel: 0116 263 4700
fax: 0116 282 4000
email: info@nebosh.org.uk

General comments

Many candidates are well prepared for this unit assessment and provide comprehensive and relevant answers in response to the demands of the question paper. This includes the ability to demonstrate understanding of knowledge by applying it to workplace situations.

There are always some candidates, however, who appear to be unprepared for the unit assessment and who show both a lack of knowledge of the syllabus content and a lack of understanding of how key concepts should be applied to workplace situations.

In order to meet the pass standard for this assessment, acquisition of knowledge and understanding across the syllabus are prerequisites. However, candidates need to demonstrate their knowledge and understanding in answering the questions set. Referral of candidates in this unit is invariably because they are unable to write a full, well-informed answer to one or more of the questions asked.

Some candidates find it difficult to relate their learning to the questions and as a result offer responses reliant on recalled knowledge and conjecture and fail to demonstrate a sufficient degree of understanding. Candidates should prepare themselves for this vocational examination by ensuring their understanding, not rote-learning pre-prepared answers.

Candidates should therefore note that Examiners' Reports are **not** written to provide 'sample answers' but to give examples of what Examiners were expecting and more specifically to highlight areas of under performance.

Common pitfalls

It is recognised that many candidates are well prepared for their assessments. However, recurrent issues, as outlined below, continue to prevent some candidates reaching their full potential in the assessment.

- Many candidates fail to apply the basic principles of examination technique and for some candidates this means the difference between a pass and a referral.
- In some instances, candidates do not attempt all the required questions or are failing to provide complete answers. Candidates are advised to always attempt an answer to a compulsory question, even when the mind goes blank. Applying basic health and safety management principles can generate credit worthy points.
- Some candidates fail to answer the question set and instead provide information that may be relevant to the topic but is irrelevant to the question and cannot therefore be awarded marks.
- Many candidates fail to apply the command words (also known as action verbs, eg describe, outline, etc). Command words are the instructions that guide the candidate on the depth of answer required. If, for instance, a question asks the candidate to 'describe' something, then few marks will be awarded to an answer that is an outline. Similarly the command word 'identify' requires more information than a 'list'.
- Some candidates fail to separate their answers into the different sub-sections of the questions. These candidates could gain marks for the different sections if they clearly indicated which part of the question they were answering (by using the numbering from the question in their answer, for example). Structuring their answers to address the different parts of the question can also help in logically drawing out the points to be made in response.
- Candidates need to plan their time effectively. Some candidates fail to make good use of their time and give excessive detail in some answers leaving insufficient time to address all of the questions.
- Candidates should also be aware that Examiners cannot award marks if handwriting is illegible.
- Candidates should note that it is not necessary to start a new page in their answer booklet for each section of a question.

UNIT B – Hazardous agents in the workplace

Section A – all questions compulsory

Question 1 *An employer is concerned that the building where a number of employees work may have high levels of the ionising radiation radon.*

(a) **Identify** the possible effects that this may have on the employees' health. (2)

(b) **Identify** the route by which employees can be exposed to radon. (4)

The employer has undertaken some measurements to determine the level of radon in the building. The results of the measurements show that the levels of radon in ground floor and basement store rooms are in excess of 400 Bq/m³.

(c) **Outline** the steps that the employer must take in order to reduce the employees' exposure to radon. (4)

This question related to Element B7 of the syllabus and assessed candidates' knowledge of learning outcome B7.3: *Explain the effects of exposure to ionising radiation, its measurement and control.*

The question required knowledge of the naturally occurring ionising radiation, radon, which is listed as a specific example in B7.3 of the syllabus. It was evident from the majority of responses to this question that candidates had little knowledge of this specific and common type of naturally occurring radiation.

In part (a) many responses were vague, simply referring to the health effects as being "to cause cancer", which was insufficient to gain marks. Only those candidates who understood the significance of the harmful effects of alpha particles once inside the body were able to be awarded the marks available.

Section 7.3 of syllabus requires knowledge of routes of exposure for ionising radiation with reference to both external and internal radiation exposure. Part (b) of the question addressed this part of the syllabus. With four marks available it was not sufficient to simply state inhalation as the route of entry. The route of exposure starts at the point where the radon occurs naturally in rock as a decay product of uranium and continues through to when the decay products of radon can become lodged in the lungs.

Many candidates who lacked specific knowledge of this type of ionising radiation answered part (c) by applying the principles of time, distance and shielding. Whilst this approach is not incorrect, it did not fully address the range of control measures that are typically applied to buildings in geographic areas with high radon levels. Only a small number of candidates appreciated the significance of the figure given in the question (400Bq/m³) in relation to the Ionising Radiations Regulations.

Candidates and accredited course providers are reminded that where a specific example is named in the syllabus (in this case radon), then it is likely that a question could address this example. Candidates may find further relevant information in the

accredited course provider references listed in the current syllabus and in particular Health Protection Agency website.

-
- Question 2** *Work-related upper limb disorders (WRULDs) can develop if ergonomic principles are not followed when designing work tools and work equipment.*
- (a) **Outline** what is meant by the term 'ergonomic principles'. (2)
- (b) **Outline** how the design of work tools and work equipment can help to minimise the risk of a person developing a WRULD. (8)
-

This question related to Element B9 of the syllabus and assessed candidates' knowledge of learning outcomes B9.1: *Outline types, causes and relevant workplace examples of injuries and ill-health conditions associated with repetitive physical activities, manual handling and poor posture* and B9.2: *Explain the assessment and control of risks from repetitive activities, manual handling and poor posture*

The parts of the syllabus specifically assessed here are in part (a) an understanding of ergonomic principles and in part (b) an understanding of how ergonomic design of tools/equipment/workstations can be a practical control measure to avoid or minimise the risk associated with repetitive physical activities.

The outline of 'ergonomic principles' required in part (a) was well answered and many candidates achieved the two marks available.

In part (b) there was a wide range of ways in which the design of work tools/equipment could minimise the risks of developing WRULDs. This question required an outline for eight marks, therefore it was important that candidates provided a sufficient range of differing points to achieve a good mark. Some candidates focused only on display screen equipment as a type of work equipment, which therefore limited their ability to gain marks. This question was about the design of work tools and work equipment in the widest sense. Responses that considered factors such as weight and size of tools, the design of handles and supports on tools/equipment as well as the amount of force required to use tools were all mark worthy.

For further help with studying this part of the syllabus, candidates should look at the ULD (upper limb disorders) pages of the HSE website.

-
- Question 3** (a) **Outline** the principles of a prospective cohort study as used in epidemiology. (4)
- (b) **Outline** factors that may affect the reliability of prospective cohort studies. (6)
-

This question related to Element B1 of the syllabus and assessed candidates' knowledge of learning outcome in B1.5: *Explain the principles of epidemiology and the principles of toxicological data to the identification of work-related ill-health.*

In particular the syllabus refers to the use and limitations of case control studies and cohort studies (retrospective and prospective).

This particular question focused on a prospective cohort study and there was some confusion with the other types of epidemiological studies (eg a case-control study). Most candidates indicated in part (a) that this type of study starts now and goes forward (rather than backwards) in time.

When answering part (b) of the question, most candidates were able to suggest at least four possible factors. A factor that was often missed was the incubation or latency period of the response or effect of exposure may be longer than the study period.

-
- Question 4** *The use of hand-held vibrating tools can cause hand-arm vibration syndrome (HAVS).*
- (a) **Outline** the health effects of HAVS. **(3)**
- (b) **Outline** factors to consider when assessing the risk to employees who make extensive use of hand-held vibrating tools. **(7)**
-

This question related to Element B6 of the syllabus and assessed candidates' knowledge of learning outcomes B6.6: *Explain the effects of vibration on the individual* and B6.7: *Explain the measurement and assessment of vibration exposure*.

Part (a) of the question asked about the health effects of HAVS and there was plenty of scope to gain the three marks available.

Part (b) was not always well answered. A common pitfall was to provide a range of control measures that could be used to reduce exposure to vibration when using hand-held vibrating tools. This misinterpretation of the question resulted in no marks being awarded.

This question asked the candidates to consider what factors are relevant when assessing the risks to the employees using these tools. This type of question occurs in other areas of Unit B, for example what should be considered when risk assessing exposure to hazardous substances or noise etc.

Candidates are reminded of the importance of approaching a question from the correct direction ie is the question asking about assessing the risk or controlling the risk.

There was a wide range of factors that could be considered in part (b) and it was important to include a wide range to gain the seven marks available.

Accuracy was required when referring to one particular factor; comparison with the exposure action value (EAV) or exposure limit value (ELV). Many candidates did not use the correct terms or were inaccurate with the naming of these terms. These terms are used within the Control of Vibration at Work Regulations and so must be stated correctly. This similar point often arises in other questions, for example, when candidates refer to terms from the Control of Noise at Work Regulations.

Question 5 *The following is referred to as a heat balance equation:*

$$M = K + C + R + E$$

- (a) **Identify EACH** of the terms in this equation **AND outline** how the equation can be used to evaluate the thermal comfort of an individual. (7)
- (b) **Outline** the natural mechanisms that occur in the human body if, due to excessive physical work activity, M is greater than $K + C + R + E$. (3)
-

This question related to Element B10 of the syllabus and assessed candidates' knowledge of learning outcome B10.1: *Explain the need for, and factors involved in, the provision and maintenance of thermal comfort in the work environment.*

Responses to this question were very limited and a significant number of candidates did not attempt this question. The heat balance equation is clearly listed in part B10.1 of the syllabus and therefore is examinable. The learning outcome B10.1 is qualified by the command word explain, therefore asking candidates to identify the terms in the heat balance equation and outline how it can be used to evaluate thermal comfort is well within the scope of the syllabus.

Those candidates who had learnt the equation were easily able to gain five of the seven marks available in part (a) by simply identifying what each of the letters M , K , C , R and E represented. Other candidates who struggled with this assessment of knowledge were able to give a reasonable outline of how the equation could be used to evaluate thermal comfort.

More candidates were able to address part (b), which required an understanding how the body responds under heat stress. Natural mechanisms such as sweating, increased heart rate and heat loss by conduction or radiation at the skin's surface can all occur.

Changes to the Unit B syllabus in 2010 have meant that a number of Elements of the syllabus, including B10, look different to previous versions of the syllabus. Candidates and accredited course providers are reminded to check that course materials adequately reflect these changes.

Question 6 *A national chain of high street off-licence stores is experiencing a significant number of incidents of violence and aggression towards its employees from customers visiting its stores.*

- (a) **Identify** the factors that could be contributing to these incidents of violence and aggression towards the employees. (4)
- (b) The chain has recently re-trained all employees in personal safety and in dealing with violent and aggressive situations.
- Other than training, **outline** a range of practical control measures that could be put in place in order to reduce the risk of violence and aggression from customers. (6)
-

This question related to Element B8 of the syllabus and assessed candidates' knowledge of learning outcomes B8.3: *Explain the scope, effects and causes of work-*

related violence/aggression and B8.4: Explain the identification and control of work-related violence/aggression with reference to legal duties.

Answers to this question were generally good with candidates tailoring their answers to reflect the scenario given in the question, rather than answering in terms of generic violent and aggressive situations.

In part (a) candidates were able to suggest a good range of factors that could be contributing to the violence and aggression, including factors specific to the scenario; for example aggression resulting from refusal to sell to those already under the influence of alcohol or without suitable proof of age ID.

Part (b) of the question did specifically exclude the need to include training in the candidates' responses, but many did not note this and included it anyway. This was not mark worthy. Most candidates were able to include a good range of control measures to reduce the risks, the use of CCTV being one of the most common. Not many candidates considered that legal measures (such as anti-social behaviour orders) could perhaps be used to exclude problem customers.

Section B – three from five questions to be attempted

- Question 7** *A small printing organisation operates a number of printing machines that are located in an open-plan workshop. Following a noise survey the organisation discovers that its employees are being exposed to noise levels of 86 dB(A) $L_{EP,d}$.*
- (a) **Outline** the significance of this noise level to an employer. (5)
- (b) **Describe** a range of technical **AND** organisational control measures that could be introduced. (15)

This question related to Element B6 of the syllabus and assessed candidates' knowledge of learning outcome B6.4: *Explain the principles of controlling noise and noise exposure.*

In part (a) the significance of the noise level quoted in the question is determined by the legal duties that are placed on an employer by the Control of Noise at Work Regulations and the possible legal implications in civil law. There is clearly a need to reduce exposure by means other than hearing protection.

The figure quoted in the question is in $L_{EP,d}$ and it was clear that some candidates do not appreciate the importance of this term when describing a noise dose. Many simply indicated this figure was "more than 85 dB(A)" ; but without the use of term $L_{EP,d}$, this statement loses meaning.

There was another issue of accuracy that was similar to that seen in question 4. Candidates compared the noise level in the question to the exposure action value (EAV) or exposure limit value (ELV) in the Control of Noise at Work Regulations. Many candidates did not use the correct terms or were inaccurate with the naming of these terms.

Most candidates who answered this popular question performed well in part (b). They provided a good range of both technical and organisational measures that could be introduced. In some cases they were confused about what was a technical control measure and what was an organisational control measure but in this particular

question their marks were not affected by this confusion. However, candidates are urged to ensure they understand the difference.

Part (b) required a description of the measures, which requires more detail than an outline and generally candidates did provide a description.

-
- Question 8** (a) **Explain** the circumstances when it may be necessary to use respiratory protective equipment (RPE) as a control measure to reduce exposure to a hazardous substance. (6)

Employees carrying out a short duration task involving a corrosive vapour of ammonia have been provided with RPE to protect them from inhalation of the corrosive vapour. The employer used the following information to determine the selection of the RPE.

Concentration of ammonia vapour in the workplace	280ppm
Workplace exposure limit for ammonia is	35ppm (15 min STEL)
Assigned protection value for selected RPE	APF= 20

- (b) **Explain** how the employer can use this information to determine if the choice of RPE is appropriate. (4)
- (c) **Outline** other factors that the employer should consider when selecting RPE for use in this particular task. (10)

This question related to Element B3 of the syllabus and assessed candidates' knowledge of learning outcome B3.2: *Explain the various types of personal protective equipment (PPE) available for use with hazardous substances and other chemicals, their effectiveness, and the relevant specifications and standards to be met.*

This question focused specifically on respiratory protective equipment as a type of personal protective equipment.

Answers to part (a) were limited with many candidates only being able to state the generic response of "as a last resort" This was not sufficient for the six marks available for this part of the question. Candidates are directed to the HSE publication HSG53, which is specifically mentioned in the syllabus. The study of this document would enable candidates to answer this question.

Most candidates seemed to be able to address part (b). This part of the question was qualified by explain, therefore it was necessary to explain in words and show with the numbers provided how the APF is determined. A few candidates guessed if the RPE choice was appropriate without showing how this decision was arrived at and this meant they did could not be awarded any marks. Deciding if the RPE is sufficient also requires consideration of a safety factor.

Part (c) produced the best responses in this question. However candidates are reminded that an 'outline' is not a list. Again the document HSG53 is a key resource when studying this part of the syllabus.

Question 9 *Methanol, an organic solvent, is being used in the production of a specialist coating. An operative's measurement of exposure to the methanol varies throughout his/her 8-hour working day. The results of measurements of the operative's exposure are as follows:*

Table 1

Task undertaken by operative	Duration of task	Exposure to methanol (ppm)
Measuring out and adding methanol	15 minutes	280
Adding other components to the mix	2 hour	90
Supervision of mixing and decanting	2 hours	150
Clean down of equipment using solvents	3 hours	150

Assume that exposure is zero at all other times.

- (a) **Calculate** the 8-hour time-weighted average (TWA) exposure to methanol for the operative.
Your answer should include detailed working to show that you understand how the exposure is determined. (8)
- (b) Information relating to methanol in EH40 Workplace exposure limits is as follows:

Table 2

Substance	CAS number	Workplace Exposure Limit				Comments
		Long-term exposure limit (8-hour TWA limit reference period)		Short-term exposure limit (15-minute reference period)		
		ppm	mg/m ³	ppm	mg/m ³	
methanol	67-56-1	200	266	250	333	Sk

*Using your results from part (a), the original exposure information in Table 1 **AND** by selecting the relevant data from Table 2, **explain** what actions might be required by the employer in order to comply with the Control of Substances Hazardous to Health (COSHH) Regulations 2002.* (8)

- (c) **Outline** how the personal exposure of the operative to methanol can be measured. (4)

This question related to Element B4 of the syllabus and assessed candidates' knowledge of learning outcomes B4.1: *Explain workplace exposure limits (WELs), the means by which they are established, and their application to the workplace* and B4.2: *Outline the strategies, methods, and equipment for the sampling and measurement of airborne contaminants.*

Candidates are always comfortable with the approach to calculating 8-hour TWA exposures and this was the case with this question. The question does specifically state "Your answer should include detailed working to show that you understand how the exposure is determined." Therefore it is necessary to show the step by step method of calculation. Sometimes those candidates who clearly found the maths simple, and got the correct numerical answer, lost one of two marks because they did not show the detailed working or forgot to qualify the numerical answer with the units ppm.

Part (b) was well answered and many candidates were able to explain that one task resulted in the workplace exposure limit (WEL) for short term exposure being exceeded. Therefore certain actions were required by the employer to comply with COSHH; for example consideration of engineering controls such as automated dispensing or charging of the solvent. Despite having performed the calculation in part (a), a number of candidates did not mention in response to part (b) that the long-term WEL was not exceeded. This meant they missed out on some of the marks available.

Responses to part (c) were very limited. Accredited course providers and candidates are urged to study and understand more fully part B4.2 of the syllabus. In the case of this question candidates needed to understand and be able to outline information contained in the following parts of the syllabus:

Sampling equipment for vapours; active devices (eg liquid or solid sorbents and pumps); passive devices.

Measurement principles (chemical and physical analysis examples spectroscopy and chromatography).

Evidence based on this and other similar questions, shows that this type of technical detail is often not known or is easily confused by candidates. In this instance many outlined gravimetric methods of measurement that are used for dusts. Accredited course providers are urged to use practical demonstration of relevant equipment when teaching this part of the syllabus.

Question 10	(a) Give the meaning of the term 'occupational health'. (4)
	(b) Outline the circumstances when health surveillance would be considered appropriate according to Regulation 11 of the Control of Substances Hazardous to Health (COSHH) Regulations 2002. (4)
	(c) Outline the arrangements that an organisation should put in place if they are to carry out health surveillance in accordance with the COSHH Regulations. (12)

This question related to Element B11 of the syllabus and assessed candidates' knowledge of learning outcomes B11.1: *Outline the nature of occupational health* and B11.3: *Outline the management of occupational health (including the practical and legal aspects)*.

This fundamental type of question assesses if candidates understand the broad principles rather than specific detail of what they are studying. It is clearly within the scope of the learning outcome B11.1. There were lots of options that would enable the candidates to gain marks. Perhaps the most straight forward meaning of the term is preventing a worker's health from being affected by his/her work conditions or occupational diseases or other risks to which he/she is exposed in the workplace.

When answering part (b) many candidates did not seem to know that lead and asbestos are not covered by the COSHH Regulations and the specific health surveillance requirements for those hazardous substances are addressed in other specific pieces of legislation. Therefore it was not relevant to use them as examples when answering part (b), which was specifically about the health surveillance requirements under COSHH.

Responses to the final part of the question were generally good. Candidates provided an outline of a wide range of arrangements that should be put in place including physical arrangements such as a suitable room, hand washing facilities, but also record keeping, the treatment and management of any samples taken as part of health surveillance activities. The question did specifically ask for arrangements in

accordance with the COSHH Regulations. Some candidates were able to gain marks for including detail on who should carry out both health surveillance and medical surveillance, which are set out in the COSHH Regulations.

Question 11 *The following is an extract from the Approved List of Biological Agents:*

Biological Agent	Classification	Notes
Hepatitis B	3	V

- (a) **Explain** the purpose and content of information included in the Approved List of Biological Agents. (6)
- (b) A healthcare research laboratory undertakes work with human blood and tissue samples that contain the biological agent listed above.
- Outline** a range of technical controls that should be used in order to minimise the risks to those working with this biological agent in the laboratory. The research work means that elimination or substitution of the biological agent is not possible. (12)
- (c) Whilst carrying out work with this biological agent a laboratory worker is exposed to the biological agent.
- Outline** the circumstances in which this exposure may result in a report to the enforcing authorities under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR). (2)

This question related to Element B5 of the syllabus and assessed candidates' knowledge of learning outcome B.5.2: *Explain the assessment and control of risk from exposure to biological agents at work.*

This question was not a popular choice but those candidates who did choose to answer produced answers with some relevant content, in particular when answering part (b).

The extract provided from the Approved List of Biological Agents should have looked familiar to candidates as the purpose of this list is specifically stated in the syllabus. Most candidates were able to explain that the purpose of the list was to classify biological agents according to their hazard and the risks they present to those exposed and the wider community. To explain the purpose for six marks, it was necessary to make reference to the four hazard classifications and say something about how those hazard classifications originate. Most candidates confused the mention of the term V in the extract as indicating that the biological agent in the question was a virus. Whilst this is true this is not what the term V means in this context. Candidates are encouraged to study this document at first hand, as they would study the relevant document for chemical agents (EH40).

The extract from the approved list confirms that hepatitis B is a class 3 biological agent and that then defines the range of technical controls measures that would need to be applied in the scenario given. Those candidates who recognised the containment level required were then able to outline a reasonable range of technical control measures. As was the case in question 7, some candidates do not appear to understand the difference between technical controls compared to organisational or indeed behavioural control measures. As a result, some of the controls included were not mark worthy.

Candidates found part (c) challenging, with most of them not understanding the requirements of RIDDOR in this situation. RIDDOR is listed as a relevant statutory provision for this element of the syllabus therefore accredited course providers should ensure candidates understand the relevance of that legislation in this context.



nebosh

The National Examination
Board in Occupational
Safety and Health

Dominus Way
Meridian Business Park
Leicester LE19 1QW

telephone +44 (0)116 2634700
fax +44 (0)116 2824000
email info@nebosh.org.uk
www.nebosh.org.uk