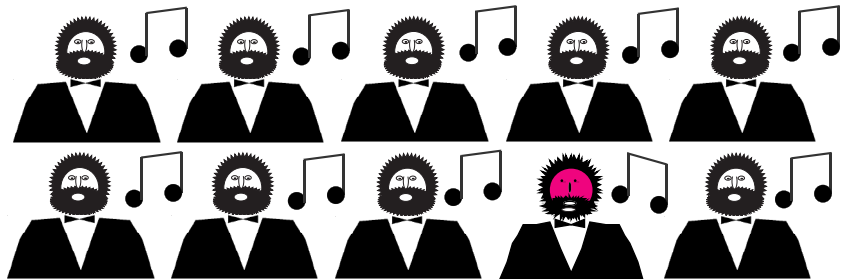


Answer 1 A focus on ergonomics ...

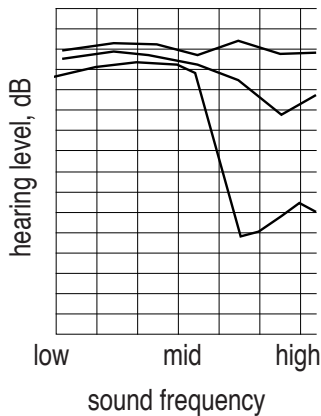
We won't repeat here everything that we have said through the various elements, but we will stress that if you have any problems at all, you must speak to your tutor.

Answer 2 A sound pressure level of 92 dB combined with another sound pressure level of 92 dB gives an overall sound pressure level of 95 dB. This 3 dB difference is barely perceptible to the human ear although it involves a doubling of the amount of energy involved. The ear will perceive a ten-fold increase in energy (ie ten similar sources) as being twice as loud.

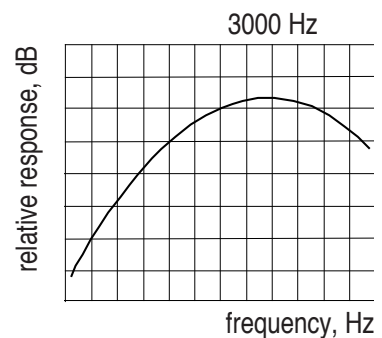
... ten times the energy, ten times the expense, ten times the enjoyment, but only twice as loud ...



Answer 3 In describing the ability of the normal young ear, you cannot go wrong if you show the frequency / response figure; you don't have to explain the figure in every detail but it is a good idea to indicate that the ear is most sensitive in the mid-frequency range (around 3000 Hz).



In briefly demonstrating the effects of hearing damage, you could use another figure which shows the response of three ears - young (normal), old (normal) and hearing damaged (which is which?) together with a brief description of the characteristics of hearing damage and natural ageing.



Answer 4 Isolation, insulation, absorption, damping, silencing ... using the study material, check your descriptions and examples of these terms; remember that, because of the ambiguity in the use of these terms, it is important to use examples to illustrate your definitions.

Answer 5 A full description of the noise characteristics of a particular environment will need to encompass:

- intensity of the noise, dB
- frequency characteristics of the noise (high frequency noise from steam jets etc)
- the pattern of the noise as it changes with time (at its most extreme, this could be periods of general engineering workshop noise with the occasional very loud impact noise from a power press) ...
- ... characteristics of any impact or percussive noise peaks which do occur
- overall noise level, summed up over a period of, perhaps, 8 hours; L_{eq} or $L_{EP,d}$
- characteristics of the workplace: reverberation time, passage of noise along duct work and so on

The purpose of drawing up this noise profile is of course to ensure that the most effective noise control measures can be taken.

Answer 6 There are many types of hearing protection but they can all be categorised as plugs or muffs; the study material gives examples of the advantages and disadvantages of each type which include:

- muffs, some advantages
 - » convenient for putting on and off in situations where the noise is not continuous (road drilling)
 - » ditto in situations where communication is required during quiet periods
 - » built-in (radio) communication possible using muffs (helicopter pilots)
- muffs, some disadvantages
 - » may clash with other ppe
 - » can prove uncomfortable with continued use
- plugs, some advantages
 - » unlikely to clash with other ppe
 - » not uncomfortable
 - » can provide good protection (for example, special plugs are available for impact noises)
 - » plugs are always ready, 'on-guard' (providing they are being worn of course)
- plugs, some disadvantages
 - » cannot easily be taken in and out (think of communication implications)
 - » require careful storage and fitting

Answer 7 Personal hearing protection, the last option in the hierarchy of control

As always, make sure that you are answering the question which is asked ...

... our question asks which options should have been eliminated before hearing protection is chosen ... a good answer should thus concentrate on the higher levels of the hierarchy. If the candidate instead provides a rich essay on hearing protection as such, very poor marks will be achieved - this happens.

Your answer should thus encompass:

- legislation - Noise Regulations and the associated action levels (don't be afraid to demonstrate to the examiners your knowledge of the action levels etc in the 2005 Noise Regulations)
- noise survey to establish the cause and characteristics of the workplace noise
- noise control - isolation, insulation ... etc
- role of hearing protection in situations where control by other means proves insufficient

Answer 8 Typical uses of the following members of the electromagnetic family of radiations are given in the study material and we will not repeat them here. We should emphasise that, firstly you should know the members of the electromagnetic family which does NOT include alpha (α) and beta (β) radiation but does include gamma (γ) radiation. Secondly, do check whether the question is referring to radiation which is produced as an (unwanted) by-product of a process, for example: infra-red from glass-blowing, ultraviolet from welding or whether the radiation is produced intentionally, as in the examples given in the study material, such as the generation of ultraviolet light for sterilisation purposes.



Answer 9 Alpha (α) and beta (β) radiation sources are used to eliminate static electricity from a product or component in order either to reduce the risk of a static discharge causing a fire or explosion (in inflammable atmospheres) or to protect workers or electronic components from risk of static shock. You could also have mentioned:

- alpha particle sources in smoke detectors
- beta particle sources used in various devices for measuring the thickness of continuously-created products such as paper and fabric

Answer 10 Ionisation ... in terms of living matter, the significance is that the injection of energy from the source of the ionising radiation will leave living cells in a highly unstable state, perhaps to return to normality, or to die or to mutate.

Answer 11 Somatic and genetic effects

- acute and chronic effects (can you name some?) which happen to the exposed individual are known as somatic effects
- ill-effects suffered by the offspring of the exposed individual and which involve chromosome damage - genetic effects

Answer 12 The three main requirements of The Ionising Radiations Regulations 1999

- justification of every practice resulting in exposure to ionising radiation
- As Low As Reasonably Practicable
- doses shall not exceed certain limits

Answer 13 Presenting the case for personal protective equipment in a positive way:

- a sensible precaution, a 'long-stop' in situations involving dangerous chemicals (acid in a laboratory) or materials (molten metal) or mechanical hazards such as grinding wheels
- good practice in situations involving groups of young and inexperienced students and visitors (notably the use of eye protection)
- striking the right balance in the hierarchy of control ... as we have said in the study material, it might be possible to introduce such a high level of engineering control in a metal-work shop that workers could wear peep-toe sandals, but this would be an absurd mis-use of resources, far better to accept that occasionally a small piece of metal will drop on to a worker's well-protected foot and to concentrate resources on ensuring that (say) large pieces of metal are always fully under control

Answer 14 The main requirements of The Personal Protective Equipment at Work Regulations:

- assess the risks ... having worked through the hierarchy of control ...
- ... select ppe which will provide the required protection
- ensure compatibility with other ppe being worn by the worker
- supply any required ppe free of charge to the workforce
- maintain it in good condition and ensure that it is properly used
- train, inform and instruct employees in the correct use

Remember that there are also legal duties placed upon employees to use the ppe correctly and to report any loss or defect.





Answer 15 Different types of ppe: we refer you to the study material for a wide range of examples of ppe - gloves, oversuits, rpe, boots, high-visibility clothing (this is a very important form of ppe), ear muffs and so on. Make sure that you have this rich 'catalogue' of equipment in your memory for just such a question.

Answer 16 The main hazards which may be created by the use of ppe include:

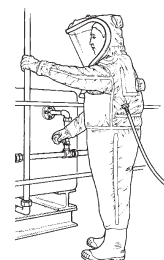
- communication problems
- discomfort (particularly in situations where there is a ppe conflict) at the worst leading to ppe being discarded with consequent loss of protection
- interference with vision and general awareness
- thermal stress, particularly in the case of full protective clothing
- false sense of security, either because the ppe has been incorrectly chosen or is faulty or poorly maintained

Answer 17 All rpe can be placed in one of two broad categories:

- respirators: air-purifying devices which range from:  to: 
- breathing apparatus: air-supplied devices which provide a supply of fresh air to the worker from an oxygen cylinder or via a supply line, for example:

Answer 18 Environments demanding the use of such air-supplied rpe devices; you should remember three particular situations:

- if there is immediate danger to health
- in cases of oxygen deficiency (no amount of purification can be guaranteed to provide the required oxygen)
- in confined spaces



Answer 19 For the 'heat-in' and 'heat-out' mechanisms of the human body - if you understand this then everything else in this subject area follows easily - see the study material for this element.

Answer 20 Thermal (heat) illnesses include:

- circulation disorders
- water or salt imbalance
- skin disorders (prickly heat)
- extreme disorders in which the body enters a state of physical and perhaps mental collapse (mental collapse may mean that the individual loses the ability to take the necessary life-saving actions)

If the body's thermoregulatory system breaks down, a rapid increase in the core body temperature will occur; sweating stops and serious mental disturbance may occur. When the core temperature reaches 42 C, rapid action is needed to cool the person to prevent death or permanent damage. The most effective way of reducing core temperature to 39 C or lower is to spray the body with tepid water (to simulate sweating) and increase air movement around the body.

Answer 21 Illnesses associated with exposure to cold:

- hypothermia (general body)
- frostbite (extremities)

Hypothermia occurs when the body core temperature falls below 35 C; the body will react by shivering between 36 and 32 C; below 32 C, shivering stops, the heart rate decreases and respiration becomes depressed, disorientation occurs and consciousness may be lost. If the core temperature falls to 26 C, there is a very serious risk of cardiac arrest and the victim needs to be placed in an environment where no further heat loss occurs and any heat which is generated by the victim's body is retained by wrapping gently in dry blankets.

Answer 22 Other factors which might be of importance in determining the level of heat stress on an individual include:

- personal protective equipment:
 - » impervious over-suits and respiratory protection
 - » water-cooled suits
 - » gloves, aprons, gloves, headware
 - » rubber suit and thigh-length boots

... with consequent implications for the body heat balance.

Personal characteristics which affect the ability of an individual to cope with heat stress include:

- general state of health, including weight, fitness
- age
- race
- sex (women have a greater density of sweat glands but men tend to sweat more readily)
- degree of acclimatisation

Answer 23 Remember, stress (and violence) should be encompassed with all the other potential workplace hazards; for a fuller answer, we refer you back to the study material.