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## Question: 1

To prevent employee injury, a lifting task is designed around the NIOSH lifting equation. The load to be lifted has good coupling and weighs 20 kg, and the frequency needed is 4 lifts per minute in an 8- hour day. The horizontal distance is 15 cm, the vertical distance is 20 cm, the vertical travel distance from the floor is 24 cm, and the maximum lift frequency is 12 lifts per minute. If there is no angle of asymmetry, calculate the recommended weight limit of the lift. To calculate, use the following formula and tables.

$$RWL = 23(25/H)[1 - (0.003|V - 75)|][0.82 + (4.5/D)][1 - 0.0032A](FM)(CM)$$

Frequency lift/min (F)	Work duration					
	≤1 Hour		>1 ≤2 Hours		>2 but ≤8 Hours	
	V < 30 inches	V ≥ 30 inches	V < 30 inches	V ≥ 30 inches	V < 30 inches	V ≥ 30 inches
≤0.2	1.00	1.00	0.95	0.95	0.85	0.85
0.5	0.97	0.97	0.92	0.92	0.81	0.81
1	0.94	0.94	0.88	0.88	0.75	0.75
2	0.91	0.91	0.84	0.84	0.65	0.65
3	0.88	0.88	0.79	0.79	0.55	0.55
4	0.84	0.84	0.72	0.72	0.45	0.45
5	0.80	0.80	0.60	0.60	0.35	0.35
6	0.75	0.75	0.50	0.50	0.27	0.27
7	0.70	0.70	0.42	0.42	0.22	0.22
8	0.60	0.60	0.35	0.35	0.18	0.18
9	0.52	0.52	0.30	0.30	0.00	0.15
10	0.45	0.45	0.26	0.26	0.00	0.13
11	0.41	0.41	0.00	0.23	0.00	0.00
12	0.37	0.37	0.00	0.21	0.00	0.00
13	0.00	0.34	0.00	0.00	0.00	0.00
14	0.00	0.31	0.00	0.00	0.00	0.00
15	0.00	0.28	0.00	0.00	0.00	0.00
>15	0.00	0.00	0.00	0.00	0.00	0.00

Coupling Type	Coupling Multiplier	
	V < 30 inches (75 cm)	V ≥ 30 inches (75 cm)
Good	1.00	1.00
Fair	0.95	1.00
Poor	0.90	0.90

- A. 261b
- B. 281b
- C. 311b
- D. 331b

**Answer: C**

Explanation:

The answer is calculated by inserting the given information into the formula.

$$RWL = 23(25/H)[1 - (0.003|V - 75)][0.82 + (4.5/D)](1 - 0.0032A)(FM)(CM)$$

$$RWL = 23(25/15)[1 - (0.003|20 - 75)][0.82 + (4.5/24)](1 - 0.0032 \times 0)(0.45)(1)$$

$$RWL = 23(1.66)[1 - (0.165)][0.82 + (0.187)](1)(0.45)(1)$$

$$RWL = 23(1.66)[1 - (0.165)][0.82 + (0.187)](1)(0.45)(1)$$

$$RWL = 14 \text{ kg}$$

Lastly, convert kilograms to pounds.

$$RWL = 14 \text{ kg} \left( \frac{2.2 \text{ lbs}}{1 \text{ kg}} \right) = 30.8 \text{ lbs}$$

## Question: 2

You work as a safety professional in a large, well-known nuclear R&D facility, but you are not involved in the radiological control side. You see a very lucrative radiation safety officer position for another company. On your application, you decide to not clarify that you do not possess expertise when it comes to radiological health and safety but hope that the hiring company will assume you do based simply on the company you currently work for. Which BCSP Code of Ethics are you in violation of?

- A. Standard 1
- B. Standard 3
- C. Standard 5
- D. Standard 7

**Answer: C**

Explanation:

Standard 5 says that safety professionals should "not misrepresent or exaggerate their degree of responsibility in or for the subject matter of prior assignments." While you may not be actively exaggerating your radiation health and safety expertise, the hiring company could easily assume that you are an expert simply because you are applying for a radiation safety officer position. Omitting your lack of expertise can be just as egregious as exaggerating your expertise when you do not have it.

## Question: 3

Carbon monoxide works by preventing oxygen from binding to the hemoglobin in red blood cells due to its higher affinity to hemoglobin. What type of bond does carbon monoxide have?

- A. Single ionic bond
- B. Double covalent bond
- C. Double ionic bond
- D. Triple covalent bond

**Answer: D**

Explanation:

The single carbon atom and the single oxygen atom are held together by a triple covalent bond.

### Question: 4

An employee experiences a standard threshold shift (STS). In response, you need to determine if the worker's hearing protection device provides a sufficient amount of noise attenuation. Personal noise sampling revealed the worker was exposed to a 400% noise dose (OSHA criteria) while using a hearing protection device (HPD) with a noise reduction rating (NRR) of 20. Based on this information, is any additional corrective action necessary? Why or why not?

- A. No. The HPD the worker is using is sufficient.
- B. Yes. Anytime a worker experiences an STS in their hearing it is due to user error: therefore, additional training needs to be given to this employee.
- C. Yes. The HPD the worker is using is insufficient.
- D. Insufficient information is provided.

**Answer: C**

Explanation:

29 CFR 1910.95 Appendix B specifies six different methods to determine the adequacy of HPD attenuation. Each method requires that (1) the employee's noise exposure be estimated either by personal or area noise monitoring, (2) C-weighted noise measurements are used, and (3) the NRR value of the HPD is known. While it is not explicitly stated which weighting network was used in the calculation of the 400% dose, OSHA criteria requires that the A-weighting is used when measuring noise. Additionally, OSHA requires that HPDs attenuate noise exposure below 90 dB(A) TWA unless the employee has experienced an STS; in that case, HPDs must attenuate noise exposure below 85 dB. The first step to solve this problem is to convert noise dose to TWA. This is done by inputting the dose of 400% into the following equation:  $TWA = 16.61 \log(400/100) + 90 = 100$  dB TWA. The second step is to subtract 7 from the NRR value due to the A-weighting being used:  $20 - 7 = 13$ . The final step is to subtract the remaining NRR value from the A-weighted TWA:  $100 - 13 = 87$  dB. Since the employee's estimated A-weighted TWA under the ear protector noise exposure is above 85 dB, this hearing protection device is not adequate. In this type of situation, it is much more effective to replace all HPDs in a work area with ones with a higher NRR value than to require the one employee to wear different HPDs than the other workers.

### Question: 5

What is the best definition of a sequence of events model?

- A. Linear cause-and-effect model
- B. Non-linear cause-and-effect model
- C. Synonymous with the systemic model
- D. Synonymous with MORT

**Answer: A**

Explanation:

The sequence of events model, also known as the domino effect model, is used in an accident/incident investigation to determine how each subsequent event led to the event directly after it. Thus, it allows a linear cause-and-effect chain to be established.

### Question: 6

Organophosphates are a group of pesticides that can cause prolonged muscle contraction by inhibiting a specific enzyme located in the neuromuscular junctions of the body. What is the name of that enzyme?

- A. Acetylcholine
- B. Choline
- C. Acetylcholinesterase
- D. Acetate

**Answer: C**

Explanation:

Inhibition of the enzyme acetylcholinesterase causes a buildup of acetylcholine as the enzyme is not able to break it down into choline and acetate. This buildup causes, among other things, prolonged muscle contractions.

### Question: 7

A radioactive source will be transported from a storage labyrinth to an experimental location that will be 22 meters away from an administrative office. The exposure rate of the source is 90 mR/hr. What is the exposure rate at 20 meters?

- A. 62 mR/hr
- B. 88 mR/hr
- C. 109 mR/hr
- D. 120 mR/hr

**Answer: C**

Explanation:

The inverse square law is used to solve this problem. This law states that the intensity of ionizing radiation is inversely proportional to the square distance from the source of the radiation. Therefore, the intensity decreases further away from the source.

$$I_1(d_1)^2 = I_2(d_2)^2$$

$$90 \text{ mR/hr} (22\text{m})^2 = I_2(20\text{m})^2$$

$$43,560 \text{ mR} \times \text{m}^2/\text{hr} = I_2(400\text{m}^2)$$

Take the inverse square law and solve for  $I_2$ .

$$I_2 = \frac{43,560 \text{ mR} \times \text{m}^2/\text{hr}}{400\text{m}^2}$$

$$I_2 = 109 \text{ mR/hr}$$

### Question: 8

What is the major difference between the two types (incineration and pyrolysis) of thermal treatment of hazardous waste?

- A. Incineration combusts material in the presence of oxygen, while pyrolysis decomposes material in the absence of oxygen.
- B. Incineration can only be used on hazardous waste with contaminants with low toxicity, while pyrolysis can be used on any hazardous waste.
- C. Pyrolysis can only be used on hazardous waste with contaminants with low toxicity, while incineration can be used on any hazardous waste.
- D. Incineration is currently not applied for the treatment of hazardous waste nearly as often as pyrolysis is.

**Answer: A**

Explanation:

Incineration is regularly used to combust material in the presence of oxygen, while pyrolysis is used rarely to decompose material in the absence of oxygen.

### Question: 9

Which EPA regulation establishes the basic "cradle to grave" approach to hazardous waste management?

- A. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- B. Resource Conservation and Recovery Act (RCRA)
- C. Toxic Substances Control Act (TSCA)
- D. Clean Air Act

**Answer: B**

Explanation:

The Resource Conservation and Recovery Act (RCRA) was passed by Congress in 1976 to address what to do with the ever-increasing volume of municipal and industrial waste. The "cradle to grave" system establishes the fact that hazardous waste is governed from the point of generation (cradle) all the way to disposal (grave).

### Question: 10

Uranium is considered nephrotoxic. Based on that information, which organ does uranium negatively affect?

- A. Heart
- B. Liver
- C. Kidneys
- D. Brain

**Answer: C**

Explanation:

The term nephrotoxic (nephrotoxicity) refers to agents which exhibit negative effects on the kidneys.



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