1.	This is an ailment caused by long-term exposure to air with high concentrations of soot or carbon-rich dust:
a)	formaldehyde
b)	sick building syndrome
c)	chimney effect
d)	black lung disease
e)	radon
	Ans: d Difficulty: Easy Link to: Introduction to Chap. 25

2.	This is a colorless and odorless gas released by some types of rock and associated with lung-cancer risk:
a)	formaldehyde
b)	sick building syndrome
c)	chimney effect
d)	black lung disease
e)	radon
	Ans: e Difficulty: Easy Link to: 25.6

3.	Discomfort, symptoms, or disease reported by many occupants of the same structure:
a)	formaldehyde
b)	sick building syndrome
c)	chimney effect
d)	black lung disease
e)	radon
	Ans: b Difficulty: Easy Link to: 25.4

4.	Formaldehyde, a common and harmful indoor air pollutant, comes from:
a)	decay of radioisotopes in bedrock and soil
b)	out-gassing from particle board and other construction materials
c)	combustion of fossil fuels

d)	household insulation
e)	household solvents and cleaning fluids

Ans: b
Difficulty: Medium
Link to: Case Study

5.	What was the apparent cause of the large number of respiratory ailments reported at the Massachusetts Registry of Motor Vehicles after it opened in 1994?
a)	ozone
b)	radon gas
c)	global warming
d)	poorly designed ventilation system
e)	mass hysteria

Ans: d
Difficulty: Easy
Link to: A Closer Look, 25.1

6.	Ozone is a natural component of the Earth's stratosphere as well as an element of photochemical smog. Ozone also can be an indoor air pollutant. Sources of ozone in homes or offices include:
a)	decay of radioisotopes in bedrock and soil
b)	combustion of fossil fuels
c)	electrolysis of tap water
d)	household solvents and cleaning fluids
e)	photocopying machines, printers, and other high-voltage electrical equipment

Ans: e
Difficulty: Easy
Link to: 25.1

7.	Twelve days after a sample of radon gas (with a half-life of about four days) is emitted into a sealed room, _____ of the original amount remains.
a)	1/2
b)	1/3
c)	1/8
d)	1/12
e)	1/16

	Ans: c Difficulty: Medium Link to: 25.6

8.	What is the principal disadvantage of bringing fresh outdoor air into a building to reduce concentrations of indoor air pollutants?	
a)	the outdoor air usually is more polluted than the indoor air	
b)	decreased miles per gallon	
c)	increased heating and air conditioning costs	
d)	that method brings radon in the building	
e)	the cost of pumping in outdoor air is greater than filtering indoor air	
	Ans: c Difficulty: Medium Link to: 25.8	

9.	One of the major objectives in designing a "green building" (as defined in your textbook) is to:	
a)	make the building energy self-sufficient	
b)	provide space for vegetation on the rooftop and other areas	
c)	minimize indoor air pollutants, including chemicals and mold	
d)	provide heating by passive solar energy	
e)	provide low-income housing	
	Ans: c Difficulty: Easy Link to: 25.7	

10.	The following statements about radon gas are all incorrect except:	
a)	radon gas is colorless and non-toxic	
b)	radon gas is identified by the "rotten egg" odor of the gas	
c)	radon is radioactive waste leaked from nuclear power plants	
d)	exposure to radon gas can cause birth defects	
e)	radon is a part of the decay chain from lead to uranium	
	Ans: a Difficulty: Medium Link to: 25.6	

11.	Reduced air circulation on aircraft has all of the following effects, dangers, or tradeoffs except:

a)	increased CO_2 levels
b)	decreased fuel efficiency
c)	increased danger of the transmittal of bacterial infections
d)	decreased on-board humidity
e)	increased reports of headaches, fatigue, nausea, etc.

Ans: d
Difficulty: Medium
Link to: Critical Thinking Issue

12.	Which of the following is **not** a potentially significant source of radon contamination?
a)	rainfall, in regions of Canada and Scandinavia for example
b)	polished granite floor tile
c)	a bedrock substrate of shale
d)	household water from a well
e)	insulation and weatherization that tightly seals a house

Ans: a
Difficulty: Easy
Link to: 25.6

13.	Which of the following indoor air pollutants contains NOx, CO, hydrogen cyanide, etc. and results in an estimated 43,000 deaths per year in the U.S. from lung cancer and heart disease?
a)	mold
b)	cleaning solvents
c)	secondhand tobacco smoke
d)	asbestos
e)	formaldehyde and other preservatives

Ans: c
Difficulty: Medium
Link to: 25.5

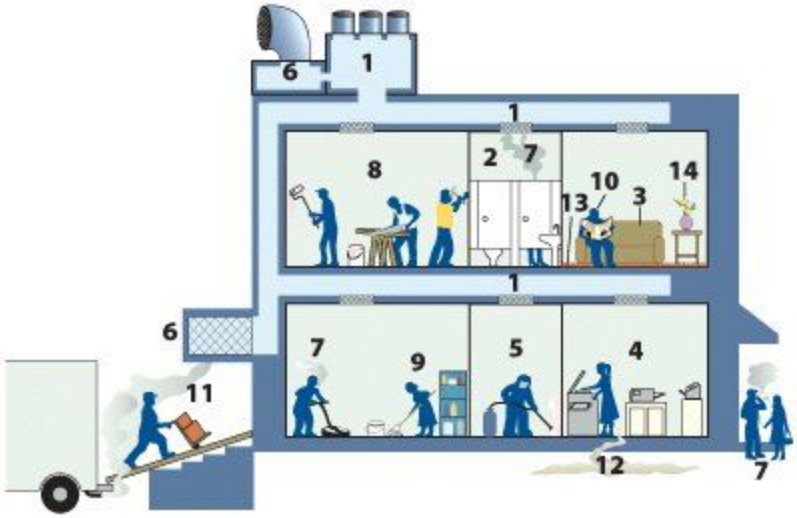
14.	One process that mobilizes indoor air pollutants is the 'chimney effect,' which:
a)	occurs in a building suffering from the 'sick building syndrome'
b)	moves more radon through homes which burn wood for heat
c)	occurs where buildings are warmer than the air around them or the rock below them
d)	occurs in tall, air-conditioned buildings
e)	concentrates radon in the lower floors of tall buildings

	Ans: c Difficulty: Easy Link to: 25.3

15.	The combined effects of exposure to radon gas and smoking are greater than the sum of the effects separately. This is an example of:
a)	biomagnification
b)	symbiotic effect
c)	body burden
d)	synergy
e)	carcinogeny
	Ans: d Difficulty: Easy Link to: 25.6

16.	Which of the following groups are most susceptible to indoor air pollutants?
a)	old people
b)	children
c)	people with a suppressed immune system
d)	people with respiratory diseases
e)	all of these
	Ans: e Difficulty: Easy Link to: 25.4

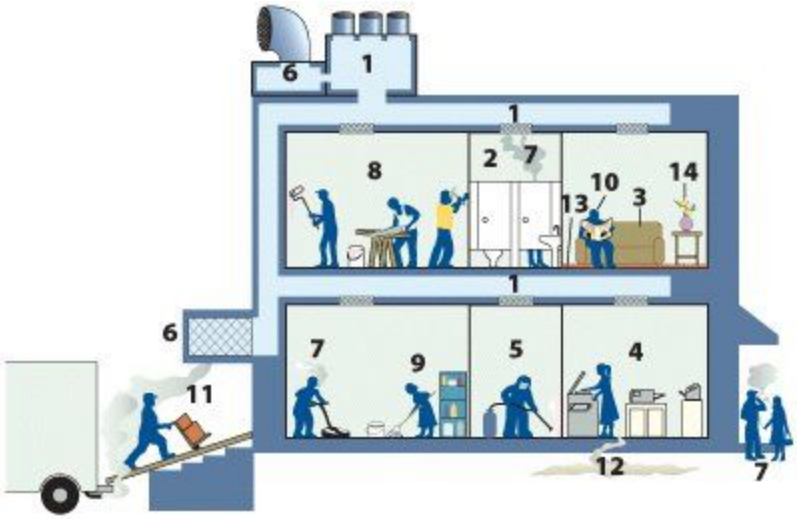
17.	In the figure below, which source of indoor air pollution is shown by #7?



a)	secondhand tobacco smoke
b)	dust mites
c)	carbon monoxide
d)	formaldehyde
e)	fecal coliform bacteria

Ans: a
Difficulty: Easy
Link to: 25.1

18.	In the figure below, which indoor air pollutant can be emitted by fax machines, computers, printers, and copiers, as illustrated by #4?

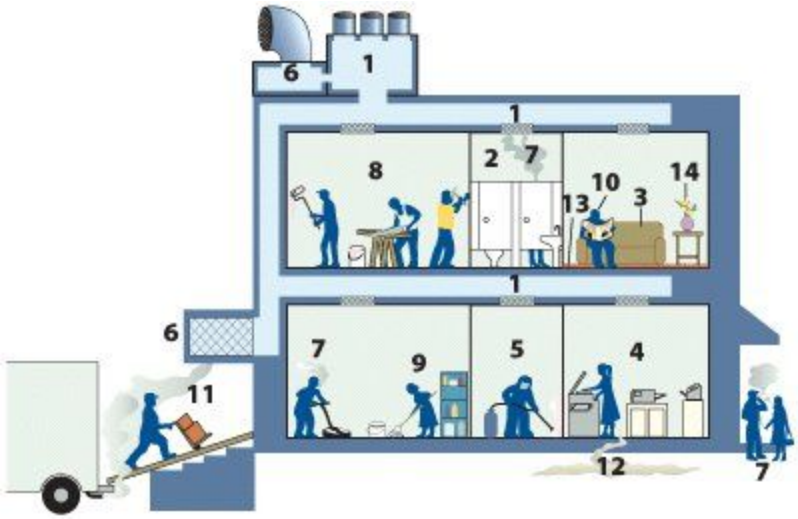


a)	formaldehyde
b)	carbon dioxide

c)	secondhand smoke
d)	radon
e)	ozone

Ans: e
Difficulty: Medium
Link to: 25.1

19. A illustrated by #1 in the figure below, heating, ventilation and air conditioning units can themselves be a source of indoor air pollutants, including:



a)	secondhand smoke
b)	dust mites and pollen
c)	bioeffluents
d)	mold, bacteria, or carbon monoxide
e)	fecal coliform bacteria

Ans: d
Difficulty: Medium
Link to: 25.1

20. Black lung disease is associated with long-term exposure to:

a)	ozone
b)	radon gas
c)	sick buildings
d)	high concentrations of petroleum vapor
e)	high concentrations of carbon-rich particles in the air

	Ans: e Difficulty: Easy Link to: Introduction to Chap. 25

21.	The number of deaths caused by lung cancer due to exposure to radon is comparable to the number of deaths caused by _____ in the U.S. each year.
a)	plane crashes
b)	lightening
c)	car accidents
d)	volcanic eruptions
e)	old age
	Ans: c Difficulty: Medium Link to: 25.6

22.	All of the following are methods to reduce the concentration of radon in a home **except**:
a)	sealing cracks or openings in foundation
b)	ventilation or suction beneath foundation
c)	better insulation and weatherization
d)	filtering of well water
e)	replacement of inappropriate building material
	Ans: c Difficulty: Medium Link to: 25.6

23.	Which of the following is **not** a potential source of radon:
a)	bedrock
b)	water wells
c)	building materials
d)	soil
e)	space heaters
	Ans: e Difficulty: Medium Link to: 25.6

24.	Radon gas is considered a threat to human health because it can:
a)	bond with hemoglobin in the blood

b)	cause lung cancer
c)	mutate cells and causes birth defects
d)	become toxic when concentrated in well-insulated homes
e)	emit alpha particles, which cause birth defects

Ans: b
Difficulty: Easy
Link to: 25.6

25.	In a large office building, a number of employees begin complaining of headaches, dizziness, and nausea at about the same time. This is an example of:
a)	Legionnaires' disease
b)	high concentrations of radon gas
c)	chimney effect
d)	mass psychosis
e)	sick building syndrome

Ans: e
Difficulty: Easy
Link to: 25.4

26.	How could a homeowner reduce the "chimney effect" in their home?
a)	sub-slab construction
b)	keep house warm
c)	insulate walls
d)	caulk windows and doors
e)	install an exhaust fan on the roof

Ans: d
Difficulty: Easy
Link to: 25.8

27.	Asbestos is hazardous to human health because:
a)	if releases toxic fumes
b)	if trapped in the lungs, it decays and damages DNA
c)	it is composed of small fibers, which damage skin or lung tissue
d)	if trapped in the lungs, if can be carcinogenic
e)	it is a potent toxin, damaging the neurological systems of humans and animals

	Ans: d Difficulty: Easy Link to: 25.1

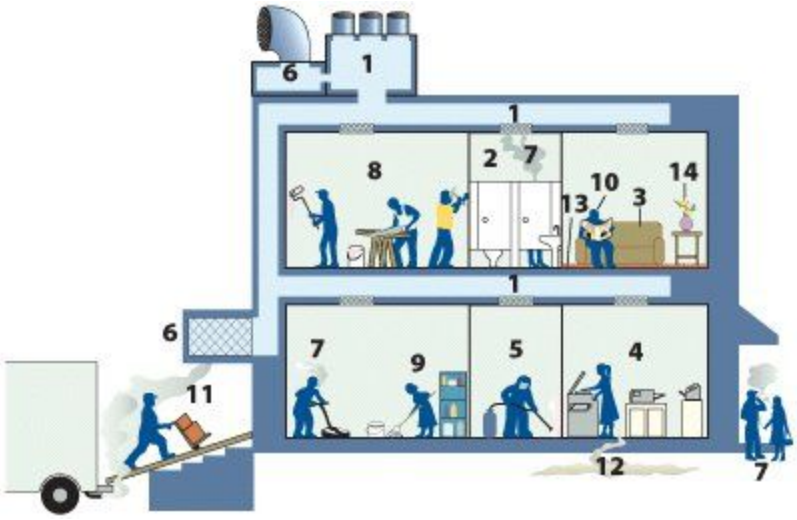
28.	Indoor air pollutants include all the following except:
a)	mold and bacteria
b)	formaldehyde
c)	polonium
d)	ozone
e)	All of these are indoor air pollutants
	Ans: c Difficulty: Easy Link to: 25.1

29.	High concentrations of indoor air pollution are most likely found in:
a)	homes constructed to be energy-efficient
b)	mobile homes
c)	homes with many pieces of hardwood furniture
d)	office buildings
e)	the cellar of any kind of building
	Ans: a Difficulty: Medium Link to: 25.1, 25.2

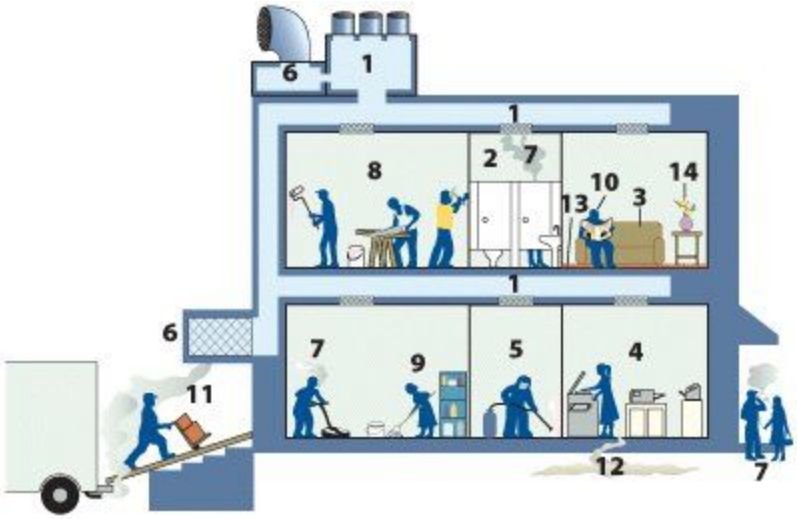
30.	There is a natural background radiation received by every human and animal. The range is between 100 and 250 millirem per year. The natural range is so wide because of local variations in:
	I. vegetation II. geology III. elevation
a)	I only
b)	III only
c)	I and II
d)	II and III
e)	I, II, and III
	Ans: d Difficulty: Medium Link to: 25.6

31.	Asbestos is _____. It is considered a dangerous substance because _____.
a)	a chemical substance; it has toxic effects on the respiratory system
b)	a natural mineral than has very thin fibers; these fibers can become trapped in the lungs and cause cancer
c)	a naturally occurring byproduct of carbon combustion; it is known to cause lung cancer
d)	a commonly used building material; it been found to emit potentially dangerous radiation
e)	a common insulator; when released into the air, it is highly toxic to humans and animals
	Ans: b Difficulty: Medium Link to: 25.1

32.	The figure below illustrates 14 potential sources of indoor air pollution. Pick any five (5) of these sources and identify them by number.



Ans:	1) heating, ventilation, and air-conditioning systems 2) restrooms 3) furniture and carpets 4) office machines (e.g., fax, computers, copiers) 5) pesticide application 6) fresh air intakes 7) smokers 8) remodeling and painting 9) cleaning 10) people 11) loading docks 12) underlying soil (radon and moisture) 13) dust mites 14) plants (pollen)
	Difficulty: Medium Link to: 25.1

33.	The figure below illustrates 14 potential sources of indoor air pollution. Pick any five (5) of these sources and (A) identify them by number, and (B) name at least one specific pollutant that comes from that source. 

Ans:

1)	heating, ventilation, and air-conditioning systems	mold, bacteria, CO, NO,
2)	restrooms	secondhand smoke, mo fungi
3)	furniture and carpets	formaldehyde, solvents asbestos

	4)	office machines (e.g., fax, computers, copiers)	ozone
	5)	pesticide application	pesticides
	6)	fresh air intakes	outdoor pollutants (e.g. exhaust)
	7)	smokers	smoke
	8)	remodeling and painting	variety of fumes
	9)	cleaning	solvents, etc.
	10)	people	CO_2, "bioeffluents," bacteria, viruses
	11)	loading docks	organics, particulates, C
	12)	underlying soil	radon and moisture
	13)	carpets, furniture	dust mites
	14)	plants	pollen

Difficulty: Difficult
Link to: 25.1

34.	In a large office building, a number of employees begin complaining of headaches, dizziness, and nausea at about the same time. What is this condition called? List some possible causes for the symptoms.
Ans:	Sick building syndrome. Possible causes: air pollutants from a variety of sources; noise; environmental stresses such as lighting, heating, or humidity; employee stress; any combination of the above

Difficulty: Medium
Link to: 25.4

35.	Houses built on a certain type of granite have a greater danger of high radon concentrations than other houses nearby that are built on a certain type of limestone bedrock. Does this imply that all the houses on the granite have high concentrations of radon? Why or why not?
Ans:	No. Houses on a uranium-rich granite may have a greater danger of radon contamination, but most of them may be well enough ventilated and/or engineered that they don't accumulate much radon gas. In contrast, houses on the limestone have no natural source of radon, and you can almost guarantee that they will have very low radon concentrations unless they use uranium-rich building materials.

	Difficulty: Medium Link to: 25.4

36.	What was the apparent cause of the large number of respiratory ailments reported at the Massachusetts Registry of Motor Vehicles after it opened in 1994?
Ans:	Poorly designed ventilation system, which led to fermentation of ceiling tiles and disintegration of fire-retardant material
	Difficulty: Easy Link to: A Closer Look. 25.1

37.	List four common indoor air pollutants and one possible source for each.
Ans:	asbestos – fireproofing, insulation airborne bacteria – bacteria in air-conditioning systems carbon monoxide – cars, stoves, and fireplaces formaldehyde – plywood particulates – second-hand smoke ozone – photocopying machine radon – uranium decay in bedrock sulfur dioxide – coal furnace volatile organics – paints and solvents
	Difficulty: Medium Link to: 25.1

38.	Is radon gas a natural or artificial substance? Where does it come from?
Ans:	Natural - comes from radium in bedrock and soil, which is part of the natural decay chain of uranium to lead
	Difficulty: Easy Link to: 25.6

39.	Why are concentrations of indoor air pollutants generally greater than those found outdoors?

Ans:	insulation and weatherization trap pollutants ventilation is generally not designed to reduce indoor air pollution
	Difficulty: Medium Link to: 25.1, 25.3

40.	List four general strategies for controlling indoor air pollution.
Ans:	ventilation source removal source modification air cleaning (e.g., filtering) consumer information and education
	Difficulty: Easy Link to: 25.8

41.	Name three ways to reduce the concentrations of radon gas in a home.
Ans:	sealing cracks or openings in foundation ventilation or suction beneath foundation filtering of well water replacement of inappropriate building material
	Difficulty: Easy Link to: 25.6, 25.8

42.	Why is the risk of lung cancer greater for (1) smokers exposed to radon gas than the sum of the risks for (2) smoking and (3) exposure to radon?
Ans:	Risk for (2+3) > Risk for (2) and risk for (3) – this is called "synergism".
	Difficulty: Medium Link to: 25.6

43.	List three pathways (vectors) for radon gas to enter a home. List one remedial course of action for each vector.

Ans:	from bedrock substrate – sub-slab suction from groundwater – filter well water from building materials – choose suitable materials
	Difficulty: Medium Link to: 25.6

44.	What is 'sick building syndrome'?
Ans:	It is a condition associated with a particular indoor environment which makes a number of people sick or uncomfortable in the same building at the same time.
	Difficulty: Easy Link to: 25.4

45.	What are dust mites, where do they live, and why are they classified as an indoor air pollutant.
Ans:	Dust mites are microscopic relatives of spiders that live in carpets, furniture, and bedding. They cause allergic reactions in a number of people.
	Difficulty: Medium Link to: 25.1

46.	Environmental tobacco smoke (“secondhand smoke”) is a major category of indoor air pollution resulting in over 40,000 deaths per year in the U.S. alone. What are the two major health threats associated with environmental tobacco smoke?
Ans:	lung cancer, heart disease
	Difficulty: Easy Link to: 25.5