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DIRECTIONS (Questions 1 through 130): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the one lettered answer or completion that is best in each case.

1. Which blood vessels are best suited for determination of pulse rate?
   (A) Superficial arteries
   (B) Deep arteries
   (C) Superficial veins
   (D) Deep veins

2. Diseases that require contact precautions include
   1. MRSA
   2. *Clostridium difficile* (C-diff)
   3. TB
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

3. Circumstances that could prevent a radiography student from meeting ARRT certification requirements include
   1. failing one or more courses in the radiography program
   2. being suspended from a radiography program
   3. being dismissed/expelled from a radiography program
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

4. For medicolegal reasons, radiographic images are required to include all the following information except
   (A) the patient’s name and/or identification number
   (B) the patient’s birth date
   (C) a right- or left-side marker
   (D) the date of the examination

5. A radiographer who discloses confidential patient information to unauthorized individuals can be found guilty of
   (A) libel
   (B) invasion of privacy
   (C) slander
   (D) defamation

6. An *iatrogenic* infection is one caused by
   (A) physician intervention
   (B) blood-borne pathogens
   (C) chemotherapy
   (D) infected droplets

7. A vasomotor effect experienced after injection of a contrast agent is characterized by all of the following symptoms except
   (A) nausea
   (B) syncope
   (C) hypotension
   (D) anxiety
8. Which of the below is the first step to be taken in the performance of a radiographic examination?
   (A) Obtain clinical history
   (B) Provide appropriate patient assistance
   (C) Verify patient identity
   (D) Use appropriate infection control

9. Which of the following drugs is used to treat dysrhythmias?
   (A) Epinephrine
   (B) Lidocaine
   (C) Nitroglycerin
   (D) Verapamil

10. Examples of a portal of entry in the cycle of infection include
    1. a break in the skin
    2. nasal mucous membrane
    3. urinary tract
    (A) 1 only
    (B) 1 and 2 only
    (C) 2 and 3 only
    (D) 1, 2, and 3

11. Administration of contrast agents for radiographic demonstration of the spinal canal is performed by which of the following parenteral routes?
    (A) Subcutaneous
    (B) Intravenous
    (C) Intramuscular
    (D) Intrathecal

12. The radiographer can help to alleviate patient anxiety in the following way(s)
    1. careful explanation of the procedure
    2. avoiding use of complex medical terms
    3. listening carefully to the patient
    (A) 1 only
    (B) 1 and 2 only
    (C) 2 and 3 only
    (D) 1, 2, and 3

13. Which of the following can be transmitted via infected blood?
    1. HBV
    2. AIDS
    3. TB
    (A) 1 only
    (B) 1 and 2 only
    (C) 2 and 3 only
    (D) 1, 2, and 3

14. The mechanical device used to correct an inefficient cardiac rhythm is a
    (A) defibrillator
    (B) cardiac monitor
    (C) crash cart
    (D) resuscitation bag

15. A small container holding several doses of medication is termed
    (A) an ampoule
    (B) a vial
    (C) a bolus
    (D) a carafe

16. You have encountered a person who is apparently unconscious and unresponsive. There is no rise and fall of the chest, and you can hear no breath sounds. You should first
    (A) begin mouth-to-mouth rescue breathing, giving two full breaths
    (B) proceed with the Heimlich maneuver
    (C) begin with 30 external chest compressions at a rate of 100 compressions/min
    (D) begin with 5 external chest compressions at a rate of 50 compressions/min

17. In classifying IV contrast agents, the total number of dissolved particles in solution per kilogram of water defines
    (A) osmolality
    (B) toxicity
    (C) viscosity
    (D) miscibility
18. A patient who is warm, flushed, or feverish is said to be
   (A) diaphoretic
   (B) febrile
   (C) cyanotic
   (D) anxious

19. Misunderstandings between cultures can happen as a result of
   1. looking directly into someone's eyes
   2. the use of certain gestures
   3. standing too close while speaking to another
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

20. The legal doctrine *res ipsa loquitur* means which of the following?
   (A) A matter settled by precedent
   (B) A thing or matter settled by justice
   (C) The thing speaks for itself
   (D) Let the master answer

21. Some proteins in latex can produce mild-to-severe allergic reactions. Medical equipment that could contain latex includes
   1. airways
   2. enema tips
   3. catheters
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

22. The request for imaging services for hospital patients generally includes the following information
   1. patient name and/or identification number
   2. mode of travel to Imaging department
   3. name of referring physician
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

23. A large volume of medication introduced intravenously over a period of time is termed
   (A) an IV push
   (B) an infusion
   (C) a bolus
   (D) a hypodermic

24. The legal document or individual authorized to make an individual's healthcare decisions, should the individual be unable to make them for himself or herself, is the
   1. advance healthcare directive
   2. living will
   3. healthcare proxy
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

25. An inanimate object that has been in contact with an infectious microorganism is termed a
   (A) vector
   (B) fomite
   (C) host
   (D) reservoir

26. In which stage of infection do the infective microbes begin to multiply?
   (A) Latent period
   (B) Incubation period
   (C) Disease phase
   (D) Convalescent phase

27. A partially obstructed airway is clinically manifested in the following way(s)
   1. dysphasia
   2. noisy, labored breathing
   3. nailbed and lip cyanosis
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3
28. All the following statements regarding hand hygiene and skin care are correct, except
(A) hands should be cleansed before and after each patient examination
(B) faucets should be opened and closed with paper towels
(C) hands should be smooth and free from chapping
(D) any cracks or abrasions should be left uncovered to facilitate healing

29. All of the following are correct concepts of good body mechanics during patient lifting/moving, except
(A) the radiographer should stand with feet approximately 12 inches apart and with one foot slightly forward
(B) the body's center of gravity should be positioned over its base of support
(C) the back should be kept straight; avoid twisting
(D) when carrying a heavy object, hold it away from the body

30. When a patient arrives in the radiology department with a urinary Foley catheter bag, it is important to
(A) place the drainage bag above the level of the bladder
(B) place the drainage bag at the same level as the bladder
(C) place the drainage bag below the level of the bladder
(D) clamp the Foley catheter

32. Possible side effects of an iodinated contrast medium that is administered intravenously include all the following except
1. a warm, flushed feeling
2. altered taste
3. rash and hives
(A) 1 only
(B) 3 only
(C) 2 and 3 only
(D) 1, 2, and 3

33. In the blood pressure reading 145/75 mm Hg, what does 75 represent?
1. The phase of relaxation of the cardiac muscle tissue
2. The phase of contraction of the cardiac muscle tissue
3. A higher-than-average diastolic pressure
(A) 1 only
(B) 2 only
(C) 1 and 3 only
(D) 2 and 3 only

34. Facsimile transmission of health information is
1. not permitted
2. permitted for urgently needed patient care
3. permitted for third-party payer hospitalization certification
(A) 1 only
(B) 2 only
(C) 2 and 3 only
(D) 1, 2, and 3

35. Forms of intentional misconduct include
1. slander
2. invasion of privacy
3. negligence
(A) 1 only
(B) 2 only
(C) 1 and 2 only
(D) 1, 2, and 3
36. Which of the following statements is correct with regard to assisting a patient from a wheelchair to an x-ray table?
   (A) The wheelchair should be parallel with the x-ray table
   (B) The wheelchair should be 45 degrees to the x-ray table
   (C) The wheelchair should directly face the x-ray table
   (D) The wheelchair footrests should be folded down for foot support during transfer

37. In her studies on death and dying, Dr. Elizabeth Kubler-Ross described the first stage of the grieving process as
   (A) denial
   (B) anger
   (C) bargaining
   (D) depression

38. You and a fellow radiographer have received an unconscious patient from a motor vehicle accident. As you perform the examination, it is important that you
   1. refer to the patient by name
   2. make only those statements that you would make with a conscious patient
   3. reassure the patient about what you are doing
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

39. A cathartic is used to
   (A) inhibit coughing
   (B) promote elimination of urine
   (C) stimulate defecation
   (D) induce vomiting

40. Another term used to describe nosocomial infections is
   (A) iatrogenic
   (B) healthcare-associated infections
   (C) droplet
   (D) airborne

41. What is the needle angle usually recommended for intravenous injections?
   (A) 90 degrees
   (B) 75 degrees
   (C) 45 degrees
   (D) 15 degrees

42. The belief that one’s own cultural ways are superior to any other is termed
   (A) ethnology
   (B) ethnobiology
   (C) ethnocentrism
   (D) ethnography

43. Potential violations of HIPAA standards include the following
   1. protected healthcare information is accessible to hospital employees only
   2. a copy of authorization for release of medical information is kept on file
   3. patient information computer files must be encrypted
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

44. Which of the following may be used to effectively reduce the viscosity of contrast media?
   (A) Warming
   (B) Refrigeration
   (C) Storage at normal room temperature
   (D) Storage in a cool, dry place

45. The type of shock often associated with pulmonary embolism or myocardial infarction is classified as
   (A) neurogenic
   (B) cardiogenic
   (C) hypovolemic
   (D) septic
46. Which of the following must be included in a patient’s medical record or chart?
   1. Diagnostic and therapeutic orders
   2. Medical history
   3. Informed consent
   (A) 1 and 2 only
   (B) 1 and 3 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

47. What type of precautions prevent the spread of infectious agents in droplet form?
   (A) Contact precautions
   (B) Airborne precautions
   (C) Protective isolation
   (D) Strict isolation

48. Which of the following conditions must be met in order for patient consent to be valid?
   1. The patient must sign the consent form before receiving sedation
   2. The physician named on the consent form must perform the procedure
   3. Blank spaces on the form must be completed by the physician after patient signature
   (A) 1 and 2 only
   (B) 1 and 3 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

49. Examples of nonverbal communication include
   1. Appearance
   2. Eye contact
   3. Touch
   (A) 1 only
   (B) 1 and 2 only
   (C) 2 and 3 only
   (D) 1, 2, and 3

50. Each of the following is an example of a fomite except
   (A) a doorknob
   (B) a tick
   (C) a spoon
   (D) an x-ray table

51. Which of the following legal phrases defines a circumstance in which both the healthcare provider’s and the patient’s actions contributed to an injurious outcome?
   (A) Intentional misconduct
   (B) Contributory negligence
   (C) Gross negligence
   (D) None of the above

52. What is the first treatment for extravasation of contrast media during an IV injection?
   (A) Apply a hot compress
   (B) Apply a cold compress
   (C) Apply pressure to the vein until bleeding stops
   (D) Remove the needle and locate a sturdier vein immediately

53. Which of the following diastolic pressure readings might indicate hypertension?
   (A) 40 mm Hg
   (B) 60 mm Hg
   (C) 80 mm Hg
   (D) 100 mm Hg

54. To reduce the back strain that can result from moving heavy objects, the radiographer should
   (A) hold the object away from his or her body when lifting
   (B) bend at the waist and pull
   (C) pull the object
   (D) push the object

55. All the following statements regarding oxygen delivery are true except
   (A) oxygen is classified as a drug and must be prescribed by a physician
   (B) the rate of delivery and mode of delivery must be part of a physician order for oxygen
   (C) oxygen may be ordered continuously or as needed by the patient
   (D) none of the above; they are all true
1. (A) **Superficial arteries** are best suited for determination of pulse rate. The five most easily palpated pulse points are the radial, carotid, temporal, femoral, and popliteal pulses. The radial pulse is used most frequently. The apical pulse, at the apex of the heart, is most accurate and can be determined with the use of a stethoscope.

2. (B) Any disease spread by direct or close contact, such as MRSA and *Clostridium difficile* (C-diff), and some wounds require contact precautions. Contact precaution procedures require a private patient room and the use of gloves and gowns for anyone coming in direct contact with the infected individual or the infected person's environment. Some facilities require healthcare workers to also wear a mask when caring for a patient with MRSA infection.

3. (C) The word **honor** implies regard for the standards of one's profession, a refusal to lie/deceive, an uprightness of character or action, a trustworthiness and incorruptibility. Other words used to describe these qualities are **honesty**, **integrity**, and **probity**.

   These are ethical qualities required of students and healthcare professionals. This honor/integrity can only be achieved in an environment where intellectual honesty and personal integrity are highly valued—and where the responsibility for communicating and maintaining these standards is widely shared. In order to meet ARRT certification requirements, candidates for the ARRT examination must answer the question: “Have you ever been suspended, dismissed, or expelled from an educational program that you have attended?” In addition to reading and signing the “Written Consent under FERPA,” allowing the ARRT to obtain specific parts of their educational records concerning violations to an honor code if the student has ever been suspended, dismissed, or expelled from an educational program attended. If the applicant answers “yes” to that question he or she must include an explanation and documentation of the situation with the completed application for certification. If the applicant has any doubts, he or she should contact the ARRT Ethics Requirements Department at (651) 687–0048, ext. 8580.

4. (B) Every radiographic image must include (1) the patient's name or ID number, (2) the side marker, right or left; (3) the date of the examination; and (4) the identity of the institution or office. Additional information may be included: the patient's birth date or age, name of the attending physician, and the time of day. When multiple examinations (e.g., chest examinations or small bowel images) of a patient are made on the same day, it becomes crucial that the time the radiographs were taken be included on the image. This allows the physician to track the patient's progress.

5. (B) A radiographer who discloses confidential information to unauthorized individuals may be found guilty of invasion of privacy. If the disclosure is in some way detrimental or otherwise harmful to the patient, the radiographer may also be accused of defamation. Spoken defamation is slander; written defamation is libel.
6. (A) The prefix iatr- is from the Greek iatros, meaning "physician." An iatrogenic infection is one caused by physician intervention or by medical or diagnostic treatment/procedures. Examples include infection following surgery and nausea or other illness following prescribed drug use.

7. (C) Reactions to contrast agents are named and categorized according to the body system(s) affected, the nature of the reaction (i.e., allergic vs. nonallergic), and its severity (i.e., mild, moderate, or severe). These reactions are categorized as mild (a nonallergic reaction), anaphylactic (allergic reaction), and vasovagal (life-threatening). Mild effects are principally emotional and anxiety-based. They are characterized by anxiety, syncope, nausea, lightheadedness, and sometimes, a few hives. The patient usually requires reassurance and not medical attention. An anaphylactic reaction is a true allergic reaction to, for example, iodinated media and can lead to a life-threatening situation. Immediate medical attention is required. Symptoms of anaphylactic reaction include laryngo/bronchospasm, hypotension, moderate-to-severe urticaria, angioedema, and tachycardia. A vasovagal reaction is life-threatening and requires a declared emergency ("code"). Symptoms of a vasovagal reaction include bradycardia, hypotension, and no detectable pulse. The fourth type of reaction, acute renal failure, may not manifest for up to 48 hours following injection of the contrast agent. Patients should notify their physician if they experience any changes in their urinary habits or any other atypical symptoms. Treatment would include hydration, dispensation of a diuretic (e.g., Lasix), and possibly even renal dialysis.

8. (C) Although each of these steps is part of a complete radiologic examination, an all-important first step is careful and accurate patient identification. Patient identification, and correctly matching the patient with the intended examination, is a routine activity in the healthcare environment. The healthcare worker has primary responsibility for checking/verifying patient identity. Most facilities require checking at least two patient identifiers. Rigorous observance of "timeout" processes prior to procedures can avoid costly events, including those involving patient identification.

9. (B) Lidocaine (Xylocaine) is an antiarrhythmic used to prevent or treat cardiac arrhythmias (dysrhythmia). Epinephrine (Adrenalin) is a bronchodilator. Bronchodilators may be administered in a spray mister, such as for asthma, or by injection to relieve severe bronchospasm. Nitroglycerin and verapamil are vasodilators. Vasodilators permit increased blood flow by relaxing the walls of the blood vessels.

10. (D) The pathway by which infectious organisms gain entry to the body is termed the portal of entry. Potential portals of entry include breaks in the skin, the gastrointestinal tract, mucous membranes of eyes, nose or mouth, the respiratory tract, and the urinary tract. Entry can be accomplished by ingestion, injection, inhalation, and across mucous membrane; the placenta serves as portal of entry between mother and fetus.

11. (D) A parental route of drug administration is one that bypasses the digestive system. The five parenteral routes require different needle placements: under the skin (subcutaneous), through the skin and into the muscle (intramuscular), between the layers of the skin (intradermal), into a vein (intravenous), and into the subarachnoid space (intrathecal).

12. (D) It is essential that the radiographer take adequate explanation of the procedure to the patient. In addition, there are times when the radiographer must inquire if proper diet and/or other preparation instructions have been followed prior to the examination. The radiographer requires the cooperation of the patient throughout the course of the examination; therefore, providing a thorough explanation will alleviate patient anxieties and permit fuller cooperation. Patient anxiety can also be reduced when the radiographer employs good listening skills, that is, looking at the patient (eye contact) and listening carefully without interruption and answering questions in a simple, clear, and direct manner, avoiding the use of elaborate medical terminology.

13. (B) Epidemiologic studies indicate that HIV and acquired immunodeficiency syndrome (AIDS) can be transmitted only by intimate contact with blood or body fluids of an infected individual. This can occur through the sharing of contaminated needles, through sexual contact, from mother to baby at childbirth, and from transfusion of contaminated
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The sudden cessation of productive ventilation and circulation is called cardiopulmonary arrest. The radiographer should be trained in basic life support (BLS) for healthcare providers. The American Heart Association uses the acronym CAB, representing circulation, airway, breathing to help individuals remember CPR step sequence. Compressions should be about 100 per minute, beginning with 30 compressions. After 30 compressions, airway should be established using the head-tilt, chin-lift movement. If the victim is not breathing normally, the professional rescuer should begin mouth-to-mouth breathing. One cycle is considered to be 30 chest compressions followed by two rescue breaths.

17. (A) In classifying contrast agents, the total number of dissolved particles in solution per kilogram of water defines the osmolality of the contrast agent. The toxicity defines how noxious or harmful a contrast agent is. Contrast agents with low osmolality have been found to cause less tissue toxicity than the ionic IV contrast agents. The viscosity defines the thickness or concentration of the contrast agent. The viscosity of a contrast agent can affect its injection rate. A thicker, or more viscous, contrast agent will be more difficult to inject (more pressure is needed to push the contrast agent through the syringe and needle or the angiocatheter). The miscibility of a contrast agent refers to its ability to mix with body fluids, such as blood. Miscibility is an important consideration in preventing thrombus formation. It is generally preferable to use a contrast agent with low osmolality and low toxicity because such an agent is safer for the patient and less likely to cause any untoward reactions. When ionic and nonionic contrast agents are compared, a nonionic contrast agent has a lower osmolality. To further understand osmolality, remember that whenever IV contrast media are introduced, there is a notable shift in fluid and ions. This shift is caused by an inflow of water from interstitial regions into the vascular compartment, which increases the blood volume and cardiac output. Consequently, there will be an increase in systemic arterial pressure and peripheral vascular resistance with peripheral vasodilation. In addition, the pulmonary pressure and heart rate increase. When the effects of osmolality on the patient are understood, it becomes clear that an elderly patient or one with cardiac disease or impaired circulation would greatly benefit from the use of an agent with lower osmolality.

16. (C) The sudden cessation of productive ventilation and circulation is called cardiopulmonary arrest. The radiographer should be trained in basic life support (BLS) for healthcare providers. The American Heart Association uses the acronym CAB, representing circulation, airway, breathing to help individuals remember CPR step sequence. Compressions should be about 100 per minute, beginning with 30 compressions. After 30 compressions, airway should be established using the head-tilt, chin-lift movement. If the victim is not breathing normally, the professional rescuer should begin mouth-to-mouth breathing. One cycle is considered to be 30 chest compressions followed by two rescue breaths.

15. (B) Injectable medications are available in two different kinds of containers. An ampoule is a small container that usually holds a single dose of medication. A vial is a somewhat larger container that holds a number of doses of medication. The term bolus is used to describe an amount of fluid to be injected. A carafe is a narrow-mouthed container; it is not likely to be used for medical purposes.

14. (A) The mechanical device used to correct an ineffective cardiac ventricular rhythm is a defibrillator. The two paddles attached to the unit are placed on a patient’s chest and used to introduce an electric current in an effort to correct the dysrhythmia. Automatic implantable cardioverter defibrillators (AICDs) are devices that are implanted in the body and that deliver a small shock to the heart if a life-threatening dysrhythmia occurs. A cardiac monitor is used to display, and sometimes record, electrocardiographic (ECG) readings and some pressure readings. A crash cart is a supply cart with various medications and equipment necessary for treating a patient who is suffering from a myocardial infarction or some other serious medical emergency. It is checked and restocked periodically. A resuscitation bag is used for ventilation, such as during CPR.

13. (B) Liver function tests are used to help determine if the liver is healthy and functioning properly. The two most common liver function tests are the liver enzyme test, which is a liver blood test used to check liver function, and the liver biopsy, which is a type of test where a small piece of liver tissue is removed for examination under a microscope.

12. (B) The radiographer should be alert to the patient’s appearance and condition, and any subsequent changes in them. These are referred to as objective signs. It is important to notice the color, temperature, and moistness of the patient’s skin.

11. (C) The radiographer should be alert to the patient’s appearance and condition, and any subsequent changes in them. These are referred to as objective signs. It is important to notice the color, temperature, and moistness of the patient’s skin.

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8. (D) Injectable medications are available in two different kinds of containers. An ampoule is a small container that usually holds a single dose of medication. A vial is a somewhat larger container that holds a number of doses of medication. The term bolus is used to describe an amount of fluid to be injected. A carafe is a narrow-mouthed container; it is not likely to be used for medical purposes.

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18. **(D)** Misunderstandings between cultures can occur as a result of the use of gestures, which have different meanings in different countries. In the United States and Europe, the "thumbs up" gesture has a positive implication. However, it is considered rude in Australia and obscene in the Middle East. Other examples of potentially misunderstood gestures include: if you compliment a Mexican child, you must touch the head, while in Asia it is not acceptable to touch the head of a child; in the Philippines, it is rude to beckon with the index finger; furthermore, in the United States, people are comfortable speaking about 18 in apart, while in the Middle East, people stand much closer together when they talk; in England, people stand further apart.

19. **(C)** The legal doctrine *res ipsa loquitur* relates to a thing or matter that speaks for itself. For instance, if a patient went into the hospital to have a kidney stone removed and ended up with an appendectomy, that speaks for itself, and negligence can be proven. *Respondeat superior* is a phrase meaning "let the master answer" or "the one ruling is responsible." If a radiographer were negligent, there may be an attempt to prove that the radiologist was responsible because the radiologist oversees the radiographer. *Res judicata* means a thing or matter settled by justice. *Stare decisis* refers to a matter settled by precedent.

20. **(D)** Medical equipment that could contain latex includes disposable gloves, tourniquets, blood pressure cuffs, stethoscopes, IV tubing, oral and nasal airways, enema tips, endotracheal tubes, syringes, electrode pads, catheters, wound drains, and injection ports. It should be noted that when powdered latex gloves are changed, latex protein/powder particles get into the air, where they can be inhaled and come in contact with body membranes. Studies have indicated that when unpowdered gloves are worn, there are extremely low levels of the allergy-producing proteins present.

21. **(D)** The imaging examination requisition is usually printed with the patient's personal information (name, address, age, referring/admitting physician's name, and the patient's hospital identification number). When examining patients who are admitted to the hospital, the requisition should also include the patient's mode of travel to the radiology department or other imaging facility (e.g., wheelchair vs. stretcher), the type of examination to be performed, pertinent diagnostic information, and any infection control or isolation information. The radiographer, having access to confidential patient information, must be mindful of compliance with HIPAA regulations.

22. **(D)** The patient's rights can be exercised on the patient's behalf by a designated surrogate or proxy decision maker if the patient lacks decision-making capacity, is legally incompetent, or is a minor. Many people believe that potential legal and ethical issues can be avoided by creating an advance healthcare directive or living will. Since all persons have the right to make decisions regarding their own health care, this legal document preserves that right in the event an individual is unable to make those decisions. An advance healthcare directive, or living will, names the healthcare proxy authorized to make all healthcare decisions and can include specifics regarding DNR (Do not resuscitate), DNI (Do not intubate), and/or other end-of-life decisions.

23. **(B)** Quantities of medication can be dispensed intravenously over a period of time via an IV infusion. A special infusion pump may be used to precisely regulate the quantity received by the patient. An IV push refers to a rapid injection; the term bolus refers to the quantity of material being injected. The term hypodermic refers to administration of medication by any route other than oral.

24. **(D)** A fomite is an inanimate object that has been in contact with an infectious microorganism. A reservoir is a site where an infectious organism can remain alive and from which transmission can occur. Although an inanimate object can be a reservoir for infection, living objects (such as humans) also can be reservoirs. For infection to spread, there must be a host environment. Although an inanimate object may serve as a temporary host
where microbes can grow, microbes flourish on and in the human host, where there are plenty of body fluids and tissues to nourish and feed the microbes. A *vector* is an animal host of an infectious organism that transmits the infection via bite or sting.

26. (B) There are four stages of infection. In the initial phase, the *latent period*, the infection is introduced and lies dormant. As soon as the microbes begin to shed, the infection becomes communicable. The microbes reproduce (during the *incubation* period), and during the actual disease period, signs and symptoms of the infection may begin. The infection is most active and communicable at this point. As the patient fights off the infection and the symptoms regress, the *convalescent* (*recovery*) phase occurs.

27. (C) Dyspnea (difficulty breathing) can precede a respiratory arrest event. Dyspnea can be caused by an aspirated foreign object, injury to the chest, tongue obstruction of airway in unresponsive person, drug overdose, etc. Dyspnea caused by a partially obstructed airway can manifest itself in the patient by wheezing, noisy/labored breathing, cyanosis of the nailbeds and lips, distention of the neck veins, and anxiety. The radiographer should not leave the patient alone, should call for assistance, assist the patient to a seated or semi-Fowler position, and prepare to assist with emergency treatment.

28. (D) Today we know that *the most important precaution in the practice of aseptic technique is proper hand hygiene*. The radiographer’s hands should be thoroughly washed with soap and warm running water for at least 15 seconds before and after each patient examination, or by using an alcohol sanitizer. If the faucet cannot be operated with the knee, it should be opened and closed using paper towels (to avoid contamination of or by the faucet). The radiographer’s uniform should not touch the sink. The hands and forearms should always be kept lower than the elbows; care should be taken to wash all surfaces and between fingers. Hand lotions should be used to prevent hands from chapping; broken skin permits the entry of microorganisms. *Disinfectants, antiseptics, and germicides are substances used to kill pathogenic bacteria*; they are frequently used in hand hygiene substances. Alcohol-based hand sanitizers have been recommended as an alternative to handwashing with soap and water, except when there is visible soiling or after caring for a patient with *Clostridium difficile* infection.

29. (D) Rules of good body mechanics include: when carrying a heavy object, hold it close to the body; the back should be kept straight; *avoid twisting* when lifting an object; bend the knees and *use leg and abdominal* muscles to lift (rather than the back muscles); whenever possible, *push or roll* heavy objects (rather than lifting or pulling). To transfer the patient with maximum safety, the radiographer must correctly use certain concepts of body mechanics. First, a *broad base of support* lends greater stability; therefore, the radiographer should stand with his or her feet approximately 12 inches apart and with one foot slightly forward. Second, stability is achieved when the body’s *center of gravity* (center of the pelvis) is positioned over its base of support. For example, leaning away from the central axis of the body makes the body more vulnerable to losing balance; if the feet are close together, balance is even more difficult to maintain.

30. (C) When caring for a patient with an indwelling Foley catheter, place the drainage bag and tubing *below the level of the bladder* to maintain the gravity flow of urine. Placement of the tubing or bag above or level with the bladder will allow backflow of urine into the bladder. This reflux of urine can increase the chance of developing a urinary tract infection (UTI).

31. (B) When transferring patients, always help the patient transfer toward the *strong* side. That is, begin with the stronger side closer to the x-ray table. Be certain that the wheels of stretchers and wheelchairs are locked during transfer. A two-person lift is not always necessary; most patients can transfer with the careful assistance of the radiographer. When assisting a patient in changing, first remove clothing from the unaffected side. If this is done, removing clothing from the affected side will require less movement and effort.

32. (B) Nonionic, low-osmolality iodinated contrast agents are associated with far fewer side effects and reactions than ionic, higher osmolality contrast agents. A *side effect* is an effect that is unintended but possibly expected and fundamentally...
not harmful. An adverse reaction is a harmful unintended effect that can be immediate or delayed. Possible side effects of iodinated contrast agents include a warm, flushed feeling, a metallic taste in the mouth, nausea, headache, and pain at the injection site. Adverse reactions include itching, anxiety, rash or hives, vomiting, sneezing, dyspnea, and hypotension.

33. (C) The normal blood pressure range for adult men and women is a 90 to 120 mm Hg systolic reading (left number) and a 50 to 70 mm Hg diastolic reading (right number). Systolic pressure is the contraction phase of the left ventricle, and diastolic pressure is the relaxation phase in the heart cycle. Therefore, in the blood pressure reading 145/75, the systolic pressure of 145 is higher than desirable, and the diastolic pressure of 75 is also higher than desirable. Systolic pressure consistently above 140 and diastolic pressure consistently above 90 is considered hypertension.

34. (C) Facsimile transmission of health information is convenient but should be used only to address immediate and urgent patient needs—and every precaution must be taken to ensure its confidentiality. It should be used only with prior patient authorization, when urgently needed for patient care, or when required for third-party payer ongoing hospitalization certification. These recommendations are made by the American Health Information Management Association (AHIMA).

35. (C) Verbal defamation of another, or slander, is a type of intentional misconduct. Invasion of privacy (i.e., public discussion of privileged and confidential information) is intentional misconduct. However, if a radiographer leaves a weak patient standing alone to check images or get supplies and that patient falls and sustains an injury, that would be considered unintentional misconduct, or negligence.

36. (B) When helping a patient out of a wheelchair, it must first be locked. Then, the footrests must be moved up and aside to prevent the patient from tripping over them or tilting the wheelchair forward. The wheelchair should be placed at a 45-degree angle with the x-ray table or bed, with the patient's stronger side closest toward the x-ray table or bed. When returning the patient to the wheelchair, once the patient is seated, the footrests should be lowered into place for the patient's comfort.

37. (A) Dr. Elizabeth Kubler-Ross explains that loss requires gradual adjustment and involves several steps. The first is denial or isolation, where the individual often refuses to accept the thought of loss or death. The second step is anger, as the individual attempts to deal with feelings of helplessness. The next is bargaining, in which the patient behaves as though "being good" like a "good patient" will be rewarded by a miraculous cure or return of the loss. Once the individual acknowledges that this is not likely to happen, depression is the next step. This depression precedes acceptance, where the individual begins to deal with fate or loss.

38. (D) An unconscious patient frequently is able to hear and understand all that is going on, even though he or she is unable to respond. Therefore, while performing the examination, the radiographer always should refer to the patient by name and take care to continually explain what is being done and reassure the patient.

39. (C) Cathartics stimulate defecation and are used in preparation for radiologic examinations of the large bowel. Diuretics are used to promote urine elimination in individuals whose tissues are retaining excessive fluid. Emetics induce vomiting, and antitussives are used to inhibit coughing.

40. (B) Healthcare-associated infections (HAIs) are infections acquired by patients while they are in the hospital; they are also termed nosocomial infections. Many of these infections are acquired by patients whose resistance has been diminished by their illness and are unrelated to the condition for which the patients were hospitalized. Infection resulting from physician intervention is termed iatrogenic. The CDC estimates that from 5% to 15% of all hospital patients acquire some type of HAI. Hospital personnel can also become infected (occupationally acquired infection).

Individuals weakened by illness or disease are more susceptible to infection than are healthy individuals. The most common HAI is the urinary tract infection (UTI), often related to the use of urinary catheters, which can allow passage of pathogens into
the patient’s body. Other types of HAIs include sepsis, wound infection, and respiratory tract infection. These are often attributable to methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE).

Droplet and airborne identify types of transmission-based precautions.

41. (D) Medications can be administered in a number of ways. *Parenteral* administration refers to drugs administered via intramuscular, subcutaneous, IV, or intrathecal routes—that is, any way other than by mouth. Intramuscular drug injections usually require that the needle form a 90-degree angle of injection. For subcutaneous injections, the needle should form a 45-degree angle. *Intravenous* injections generally require that the needle form about a 15-degree angle with the arm.

42. (C) Ethnocentrism is the belief that one’s personal experience and perception of the world is superior to the experiences and perceptions of others, that is, the belief that one’s own cultural ways are superior to any other. Ethnocentrism can be found in all cultures and is the most significant barrier to good communication. Ethnology is the comparative study of various cultures. Ethnobiology is the study of biological characteristics of various races. *Ethnography* is the study of a single society’s culture.

43. (D) Most institutions now have computerized, paperless systems for patient information transmission; these systems must ensure confidentiality in compliance with Health Insurance Portability and Accountability Act (HIPAA) of 1996 regulations. *Only healthcare professionals having been trained in HIPAA compliance may have access to the computerized system via personal password, thus helping ensure confidentiality of patient information.* Computer files containing patient information must be encrypted. If authorization for release of medical information is given, a copy of that authorization must be kept on file. All medical records and other individually identifiable health information, whether electronic, on paper, or oral, are covered by HIPAA legislation and by subsequent Department of Health and Human Services (HHS) rules that took effect in April of 2001.

44. (A) Iodinated contrast material can become somewhat *viscous* (i.e., thick and sticky) at normal room temperatures. This makes injection much more difficult. Warming the contrast medium to body temperature serves to reduce viscosity. This may be achieved by placing the vial in warm water or putting it into a special warming oven.

45. (B) Cardiogenic shock is related to cardiac failure and results from interference with heart function. It can occur in cases of cardiac tamponade, pulmonary embolus, or myocardial infarction. Hypovolemic shock is related to loss of large amounts of blood, either from internal bleeding or from hemorrhage associated with trauma. Neurogenic shock is associated with the pooling of blood in the peripheral vessels. This occurs in cases of trauma to the central nervous system that results in decreased arterial resistance and pooling of blood in peripheral vessels. Septic shock, along with anaphylactic shock, generally is classified as vasogenic shock.

46. (D) The Joint Commission (formerly the Joint Commission on the Accreditation of Health-care Organizations [JCAHO]) is the organization that accredits healthcare organizations in the United States. The Joint Commission sets forth certain standards for medical records, both written and electronic. In keeping with these standards, all diagnostic and therapeutic orders must appear in the patient’s medical record or chart. In addition, patient identification information, medical history, consent forms, and any diagnostic and therapeutic reports should be part of the patient’s permanent record. The patient’s chart is a means of communication between various healthcare providers.

47. (B) Category-specific isolations have been replaced by transmission-based precautions: airborne, droplet, and contact. Under these guidelines, some conditions or diseases can fall into more than one category. *Airborne precautions* are employed with patients suspected or known to be infected with *tubercle bacillus* (TB), chickenpox (varicella), or measles (rubella). Airborne precautions require that the patient wear a *string* mask to avoid the spread of bronchial secretions or other pathogens during coughing. If the patient is unable or unwilling to wear a mask, the radiographer must wear one, and for a patient in airborne precautions that would be an N95 particulate respirator mask. The
radiographer should wear gloves, but a gown is required only if flagrant contamination is likely. Patients under airborne precautions require a private, specially ventilated (negative-pressure) room. A private room is also indicated for all patients on droplet precautions, that is, with diseases transmitted via large droplets expelled from the patient while speaking, sneezing, or coughing. The pathogenic droplets can infect others when they come in contact with mouth or nasal mucosa or conjunctiva. Rubella ("German measles"), mumps, and influenza are among the diseases spread by droplet contact; a private room is required for the patient, and healthcare practitioners should wear a string mask and may also wear gown and gloves as needed. Any diseases spread by direct or close contact, such as MRSA, conjunctivitis, and hepatitis A, require contact precautions. Contact precautions require a private patient room and the use of gloves, gown, and sometimes a mask for anyone coming in direct contact with the infected individual or his or her environment.

48. (A) Informed consent is required for procedures that involve risk; many imaging procedures require signed consent. Informed consent is also required for procedures that are considered experimental, or for any research in which the patient is participating. The consent form must be complete prior to being signed; there should be no blank spaces on the consent form when the patient signs it. The patient must sign the consent form before receiving sedation. The physician named on the consent form must perform the procedure; no other physician should perform it. In the case of a minor, a parent or guardian is required to sign the form. If a patient is not competent, then the legally appointed guardian must sign the consent form. Remember that obtaining consent is the physician’s responsibility, so the explanation of the procedural risks should be performed by the physician, not by the radiographer. The informed consent can be revoked by the patient at any time.

49. (D) The importance of effective and professional patient communication skills cannot be overemphasized; the interaction between the patient and radiographer generally leaves the patient with a lasting impression of his or her healthcare experience. Of course, communication refers not only to the spoken word (i.e., verbal communication) but also to unspoken/nonverbal communication. Facial expression can convey caring and reassurance or impatience and disapproval. Pursed lips, pointed fingers, frowns, and hands on hips all indicate disapproval. Similarly, a radiographer’s touch can convey his or her commitment to considerate care, or it can convey a rough, uncaring, hurried attitude. Making eye contact while speaking is generally considered polite and respectful in the United States, whereas it can be considered just the opposite in other cultures (e.g., Asian, East Indian, Native American). Our appearance gives an impression about how we feel about our work and our patients; it is very much a part of communication and we should strive for a professional appearance/image.

50. (B) Many microorganisms can remain infectious while awaiting transmission to another host. A contaminated inanimate object such as a food utensil, doorknob, or IV pole is referred to as a fomite. A vector is an insect or animal carrier of infectious organisms, such as a rabid animal, a mosquito that carries malaria, or a mouse/deer tick that carries Lyme disease. They can transmit disease through either direct or indirect contact.

51. (B) A circumstance in which both the healthcare provider’s and the patient’s actions contribute to an injurious outcome is termed contributory negligence. An example would be a patient who fails to follow the physician’s orders or fails to show up for follow-up care and then sues when the condition causes permanent damage. Another example would be a patient who deliberately gives false information about the ingestion of drugs, leading to adverse effects from medications administered. Most states do not completely dismiss injury if there has been negligence on the part of the healthcare institution, even if the patient’s actions contributed substantially to the injury. Rather, comparative negligence is applied, where the percentage of the injury owing to the patient’s actions is compared with the total amount of injury. A jury may decide that a physician was negligent in his or her actions, but because the patient lied about using an illegal street drug that contributed to the injurious outcome, the patient is 80% responsible for his or her condition. The party suing may be awarded $100,000 for injuries but actually would receive only $20,000. Gross negligence occurs when there is willful or deliberate neglect of the patient. Assault, battery, invasion of
privacy, false imprisonment, and defamation of character all fall under the category of intentional misconduct.

52. (C) Extravasation of contrast media into surrounding tissue is potentially very painful. If it does occur, the needle should be removed and the extravasation cared for immediately (before looking for another vein). First, pressure should be applied to the vein until bleeding stops. Application of a cold pack to the affected area helps to relieve pain, and elevate the part. Application of a warm towel at the injection site can hasten absorption of any contrast medium.

53. (D) The normal blood pressure range for adult men and women is 90 to 120 mm Hg systolic reading (left number) and 50 to 70 mm Hg diastolic reading (right number). Systolic pressure is the contraction phase of the left ventricle, and diastolic pressure is the relaxation phase in the heart cycle. Systolic pressure consistently above 140 and diastolic pressure consistently above 90 is considered hypertension.

54. (D) When moving heavy objects, there are several rules that will reduce back strain. When carrying a heavy object, hold it close to your body. Your back should be kept straight; avoid twisting. When lifting an object, bend at the knees and use leg and abdominal muscles to lift (rather than your back muscles). Whenever possible, push or roll heavy objects (i.e., mobile unit), rather than pulling or lifting.

55. (D) None of the statements in the question is false; all are true. Oxygen is classified as a drug and must be prescribed by a physician. The rate and mode of delivery of oxygen must be specified in the physician’s orders. It can be ordered to be delivered continuously or as needed.

56. (A) It is unlikely that the radiographer will be faced with a wound hemorrhage because bleeding from wounds is controlled before the patient is seen for x-ray examination. However, if a patient does experience hemorrhaging from a wound, you should apply pressure to the bleeding site and call for assistance. Delay can lead to serious blood loss.

57. (B) A double-contrast GI examination requires that the patient ingest gas-producing powder, crystals, pills, or beverage followed by a small amount of high-density barium. The patient then may be asked to roll in the recumbent position in order to coat the gastric mucosa while the carbon dioxide expands. This procedure provides optimal visualization of the gastric walls. Although a double-contrast BE uses a negative contrast agent, it is not ingested but rather is delivered rectally. An oral cholecystogram can be performed approximately 3 hours after ingestion of special ipodate calcium granules. An IVU requires an IV injection of iodinated contrast medium.

58. (C) Category-specific isolations have been replaced by transmission-based precautions: airborne, droplet, and contact. Under these guidelines, some conditions or diseases can fall into more than one category. Airborne precautions are employed with patients suspected or known to be infected with tuberculosis (TB), chickenpox (varicella), or measles (rubella). Airborne precautions require that the patient wear a string mask to avoid the spread of bronchial secretions or other pathogens during coughing. If the patient is unable or unwilling to wear a mask, the radiographer must wear a string mask to avoid the spread of bronchial secretions or other pathogens during coughing. The radiographer should wear gloves, but a gown is required only if flagrant contamination is likely. Patients under airborne precautions require a private, specially ventilated (negative-pressure) room. A private room is also indicated for all patients on droplet precautions, that is, with diseases transmitted via large droplets expelled from the patient while speaking, sneezing, or coughing. The pathogenic droplets can infect others when they come in contact with mouth or nasal mucosa or conjunctiva. Rubella ("German measles"), mumps, and influenza are among the diseases spread by droplet contact; a private room is required for the patient, and healthcare practitioners should wear a string mask if within 3 ft of patient. Any diseases spread by direct or close contact, such as methicillin-resistant Staphylococcus aureus (MRSA), conjunctivitis, and Rotavirus, require contact precautions. Contact precautions require a private patient room and the use of gloves and gowns for anyone coming in direct contact with the infected individual or his or her environment.

59. (D) Medications can be administered in a number of ways: orally, sublingually, topically, and parentally. Oral denotes delivery by mouth (e.g., analgesics, etc.). Sublingual refers to medication placed...