

## **BIOMEDICAL SCIENCES**

- 1** Folic acid has tetrahydrofolate coenzyme activity which is based on the:
  - a. pyrimidine ring.
  - b. purine ring.
  - c. pyrazine ring.
  - d. pteridine ring.
  - e. pyridine ring.
  
- 2** Which of the following releases enkephalins?
  - a. Pineal gland
  - b. Thyroid gland
  - c. Periaqueductal grey matter
  - d. Reticular activating system
  - e. Pituitary gland
  
- 3**  $\beta$ -Carotene is the precursor of:
  - a. retinol.
  - b. thiamine.
  - c. calciferol.
  - d. riboflavin.
  - e. retinoic acid.
  
- 4** Which of the following statements regarding transcription is correct?
  - a. The enzyme responsible for initiating transcription is RNA polymerase.
  - b. The enzyme responsible for initiating transcription is DNA polymerase.
  - c. During transcription, the genetic information contained in the nucleotide sequence of tRNA is translated into a protein structure.
  - d. The process of transcription includes the splicing of exons.
  - e. Following initiation, the next stage of transcription is termination.

- 5 Which of the following organisms is an obligate intracellular bacteria, making it resistant to cell wall-active antibiotics?
- Escherichia coli*
  - Legionella pneumophila*
  - Staphylococcus aureus*
  - Streptococcus pneumoniae*
  - Chlamydomphila pneumoniae*
- 6 Which of the following blood vessels transports nutrient rich blood from the intestines to the liver?
- Hepatic artery
  - Hepatic portal vein
  - Great saphenous vein
  - Inferior vena cava
  - Superior vena cava
- 7 The blood volume of the average adult is approximately:
- 5 L.
  - 10 L.
  - 15 L.
  - 20 L.
  - 25 L.
- 8 In adults, community-acquired pneumonia caused by which of the following organisms is associated with the highest mortality rate?
- Chlamydomphila pneumoniae*
  - Mycoplasma pneumoniae*
  - Haemophilus influenzae*
  - Streptococcus pneumoniae*
  - Pneumocystis jirovecii*
- 9 Which of the following is the major inhibitory neurotransmitter in the brain?
- Gamma-aminobutyric acid
  - Dopamine
  - Glutamate
  - Acetylcholine
  - Glycine
- 10 Which of the following enzymes catalyzes the synthesis of DNA from viral RNA?
- Reverse transcriptase
  - DNA polymerase
  - RNA polymerase
  - Endonuclease
  - Aminoacyl-tRNA synthetase
- 11 Of the essential transition metal ions found in the human body, the one present at highest overall concentration is:
- copper.
  - cobalt.
  - iron.
  - manganese.
  - zinc.

- 12** The optic disc is also called the:
- blind spot.
  - cornea.
  - iris.
  - pupil.
  - macula lutea.
- 13** If systemic blood pressure decreases, which of the following would occur to help return blood pressure to normal?
- Increased urine production
  - Increased acetylcholine release
  - Increased aldosterone secretion
  - Increased diameter of systemic arterioles
  - Increased erythropoietin production
- 14** Which of the following muscle groups are innervated by the sciatic nerve?
- Calf muscles
  - Deep back muscles
  - Shoulder muscles
  - Quadriceps femoris muscles
  - Abdominal muscles
- 15** Which of the following does **NOT** empty its contents into the gastrointestinal tract?
- Liver
  - Pancreas
  - Spleen
  - Submandibular gland
  - Appendix
- 16** Achieving a high level of herd immunity is an important public health strategy because it:
- reduces immunization costs in communities.
  - enhances individual immunologic responses.
  - facilitates animal handling.
  - protects people who cannot be immunized.
  - requires fewer booster doses.

### **PHARMACEUTICAL SCIENCES**

- 17** All of the following statements concerning the lyophilization of a parenteral product are correct, **EXCEPT**:
- there is minimal loss of activity in heat labile materials.
  - the liquid must be frozen to below the eutectic temperature.
  - the solute usually forms an amorphous glass.
  - the eutectic temperature is the freezing point of the drug solution.
  - water is removed from the frozen mixture by sublimation.

**18** Dopamine is useful in the treatment of cardiogenic shock because it:

- a. selectively dilates renal and mesenteric vascular beds.
- b. does not induce peripheral vasoconstriction.
- c. decreases the force of myocardial contraction.
- d. delays the atrioventricular (AV) conduction time.
- e. prolongs the QT interval on the ECG.

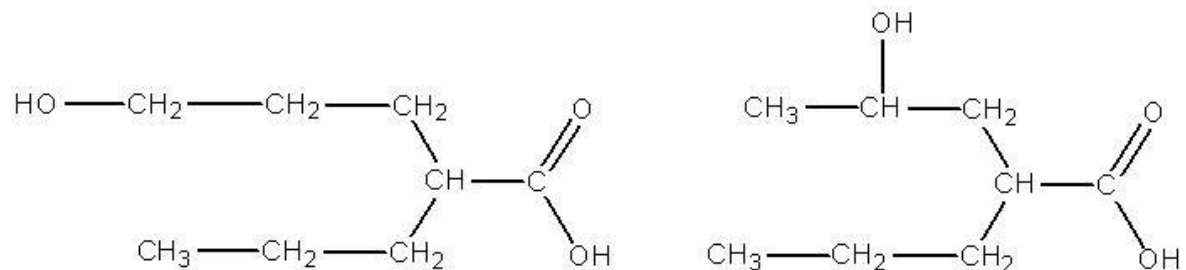
**19** Concentration of a drug in breast milk exceeds that in plasma, if the drug:

- a. is basic.
- b. is protein bound.
- c. is acidic but not protein bound.
- d. has a small volume of distribution.
- e. has a large volume of distribution.

**20** Drug A is administered by continuous IV infusion at a rate of 2 mg/min. It has an average half-life of 1.5 h and a volume of distribution of 150 L in an average 70 kg patient. Using this information, what is the steady-state concentration of Drug A in plasma?

- a. 1.5 mg/L
- b. 1.7 mg/L
- c. 2.1 mg/L
- d. 2.4 mg/L
- e. 2.7 mg/L

**21**



Valproic acid is metabolized by aliphatic hydroxylation to the above two structures.

The relationship between the two metabolites illustrates the concept of:

- a. conformational isomerism.
- b. structural isomerism.
- c. geometric isomerism.
- d. optical isomerism.
- e. diastereoisomerism.

**22** Which of the following medications induces an isoform of cytochrome P450?

- a. Carbamazepine
- b. Clarithromycin
- c. Amiodarone
- d. Metronidazole
- e. Bosentan

**23** Diazepam Injection U.S.P

Diazepam 5 mg/ml

Ethanol 10%

Propylene glycol 40%

Benzyl alcohol 1.5%

Water for Injection qs 100%

In the formulation given above, propylene glycol functions as a(n):

- a. emulsifier.
- b. antioxidant.
- c. cosolvent.
- d. buffer.
- e. preservative.

**24** Which of the following directly influences the *in vitro* physical stability of an oil-in-water emulsion in which the drug is incorporated in the dispersed phase?

- a. Amount of preservative added
- b. Molecular weight of the drug
- c. Solubility of the emulsifier in water
- d. Particle size of the internal phase
- e. Type of suspending agent used

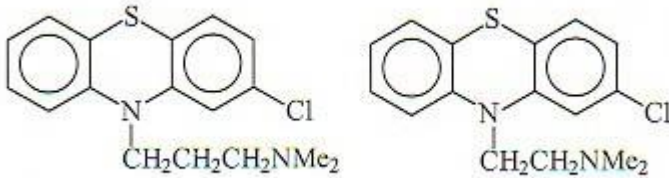
**25** Abatacept acts by:

- a. stimulating adenosine receptors.
- b. binding to MHC Class II on B cells.
- c. inhibiting B cell receptors.
- d. activating T cell receptors.
- e. binding CD80/86 on antigen-presenting cells.

**26** With respect to bioequivalence, the parameter " $C_{max}$ " is:

- a. affected by the extent of absorption only.
- b. affected by the rate of absorption only.
- c. affected by neither rate nor extent of absorption.
- d. affected by both rate and extent of absorption.
- e. the only significant parameter.

27



The above structures are related to one another as:

- bioisosteres.
  - enantiomers.
  - homologs.
  - rotamers.
  - positional (structural) isomers.
- 28 Five subjects given a single intravenous dose of a drug have the following elimination half-lives: 3, 9, 6, 5, and 4 h (hours). The mean half-life is:
- 4 h.
  - 5 h.
  - 5.4 h.
  - 5.8 h.
  - 6 h.
- 29 Reasons for using coatings on tablets include all of the following, **EXCEPT**:
- to mask the taste of the drug.
  - to mask the odor of the drug.
  - to improve the appearance of the tablet.
  - to increase the drug's release rate.
  - to protect the drug from stomach acid.
- 30 Which of the following terms indicates a loss of moisture?
- Deliquescence
  - Efflorescence
  - Hygroscopicity
  - Polymorphism
  - Condensation
- 31 Which of the following statements is **FALSE** regarding tablet formulation?
- Diluents are fillers to add bulk to the tablet.
  - Lubricants help the patient to swallow the tablet more easily.
  - Binding agents may be added dry or in solution.
  - Disintegrants draw water into the tablet causing it to burst.
  - Glidants promote the flow of materials during compression.

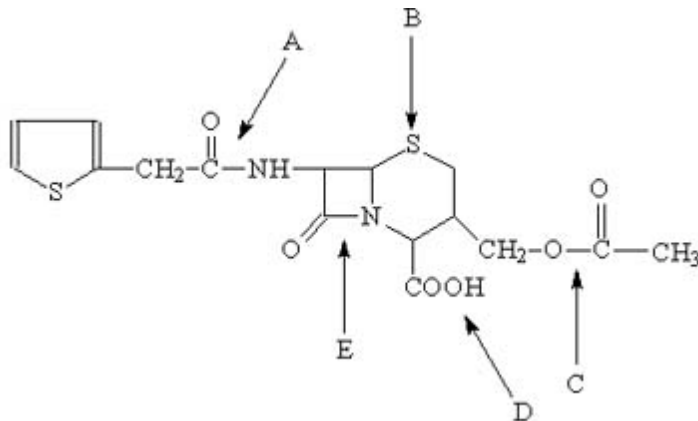
32 Factors that determine bioequivalence of two brands of a drug include the:

- a. taste of the preparations.
- b. physical appearance of the preparations.
- c. pharmacokinetic parameters of the preparations.
- d. cost of the preparations.
- e. package size of the preparations.

33 The total body clearance of a drug is 200 mL/min in a normal healthy adult and the renal clearance is 10 mL/min. This is most likely explained by the fact that the drug:

- a. is extensively metabolized.
- b. accumulates in patients with moderate renal failure
- c. undergoes significant entero-hepatic recycling.
- d. is not bound to plasma proteins.
- e. is concentrated in adipose tissue.

34 The major pathway for the biotransformation of the following compound is by hydrolysis. Identify the site which would be most susceptible to hydrolysis.



- a. A
- b. B
- c. C
- d. D
- e. E

35 Imatinib is an anticancer agent used in the treatment of chronic myelogenous leukemia that acts by inhibiting the activity of:

- a. tyrosine kinase of Bcr-Abl.
- b. tyrosine kinase of HER-2.
- c. tyrosine kinase of FGFR.
- d. histone deacetylases.
- e. serine/threonine kinase mTOR.

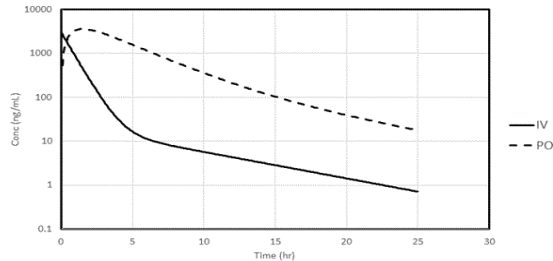
- 36** Which of the following diuretics is used to block the  $\text{Na}^+ - \text{H}^+$  exchange system of the renal tubule?
- Furosemide
  - Hydrochlorothiazide
  - Spirolactone
  - Acetazolamide
  - Amiloride
- 37** Atropine poisoning can be recognized by all of the following signs or symptoms, **EXCEPT**:
- dry skin.
  - flushed appearance.
  - delirium and restlessness.
  - mydriasis.
  - diarrhea.
- 38** The organophosphates commonly found in insecticides are thought to act by which of the following mechanisms?
- Combining with acetylcholine
  - Potentiating the action of acetylcholinesterase
  - Forming a very stable complex with acetylcholinesterase
  - Reacting at the cholinergic receptor
  - Preventing the release of acetylcholine from the nerve ending
- 39** Which of the following is a selective adrenergic  $\beta_1$ -blocker with endothelium-dependent vasodilating properties?
- Nebivolol
  - Metoprolol
  - Acebutolol
  - Nadolol
  - Carvedilol
- 40** Which of the following statements is correct regarding the use of monoclonal antibody drug therapies?
- Flu-like symptoms commonly occur at the start of therapy.
  - T cells are stimulated and will initiate a host rejection process.
  - Adalimumab is a murine-derived immunoglobulin monoclonal antibody product.
  - Use of chimeric monoclonal antibodies is associated with increased immunogenicity.
  - Use of Fc fragments avoids raising an immune response against the FAB part.
- 41** In some parenteral formulations, sodium metabisulphite is included as:
- an antioxidant.
  - a chelator.
  - a solubilizer.
  - a cosolvent.
  - an emulsifier.



- 42** The carbonic anhydrase inhibitor dorzolamide is structurally classified as a:
- biguanide.
  - butyrophenone.
  - sulfonamide.
  - sulfonylurea.
  - thiazolidinedione.
- 43** Which of the following statements is **FALSE** regarding virus vectors used in the production of biotechnology drugs?
- Viruses can be introduced by nutrients.
  - Viruses can be generated by an infected production cell line.
  - The most frequent source of virus introduction is the growth media.
  - Viruses can be inactivated by physical or chemical treatment of the product.
  - There is a trend toward using better-defined growth media in which serum levels are significantly reduced.
- 44** Which of the following excipients is **NOT** commonly found in biotechnology formulations?
- Albumin
  - Lysine
  - Tween 20
  - Saline
  - Phosphate
- 45** An angiotensin-converting enzyme (ACE) inhibitor for which both renal elimination and metabolism are important in the elimination of the drug and its active metabolites is:
- enalapril.
  - fosinopril.
  - lisinopril.
  - quinapril.
  - ramipril.
- 46** Once daily dosing of aminoglycosides is effective due to:
- prolonged residence of the antibiotic in the body.
  - post-antimicrobial effect.
  - enhanced tissue accumulation.
  - reduced renal clearance.
  - higher peak-trough differences.
- 47** How much NaCl is required to make 100 mL of isotonic 0.5% phenylephrine HCl solution? (NaCl equivalent of phenylephrine HCl is 0.32)
- 100 mg
  - 300 mg
  - 500 mg
  - 740 mg
  - 900 mg

- 48** Which of the following nonparenteral routes of administration yields the best bioavailability of biotechnology protein drugs?
- Oral
  - Rectal
  - Ocular
  - Pulmonary
  - Transdermal
- 49** Theoretically, the shelf life of a pharmaceutical tablet preparation is best measured by a change in which of the following?
- Permeability of the drug
  - Dissolution of the drug
  - Strength of the drug
  - Solubility of the drug
  - Partitioning of the drug
- 50** A drug that is considered to be low clearance and is metabolized entirely by the liver is sensitive to changes in:
- drug binding to plasma proteins.
  - bile secretion.
  - hepatic blood flow.
  - renal blood flow.
  - p-glycoprotein transport activity.
- 51** Which of the following statements is correct about transdermal drug administration?
- Most drugs can permeate the skin and enter the systemic circulation.
  - Transdermal absorption achieves a fast onset of drug action.
  - The skin is tolerant to most drugs and chemicals in transdermal delivery systems.
  - Transdermal administration produces minimal variations in drug absorption.
  - Hair follicles are a determinant in limiting transdermal drug absorption.

- 52 Two drugs (Drug A and Drug B) were administered at a dose of 10 mg/kg to two subjects. Drug A was administered intravenously and Drug B was administered orally. Plasma samples were collected and concentrations of both drugs were measured. A semilog plot of concentration vs. time is shown below. The concentration of Drug A is represented by the solid line and Drug B by the dashed line.



Which of the following statements is correct?

- The absorption rate constants for Drug A and Drug B can be estimated from the plot.
  - Drug B has a lower clearance than Drug A.
  - Drug A has a larger distribution volume than Drug B.
  - Drug B has a higher plasma protein binding than Drug A.
  - The volume of distribution for Drug A can be estimated from the plot.
- 53 Which of the following drugs is an antagonist at the central presynaptic  $\alpha_2$ -adrenergic receptors?
- Clonidine
  - Terazosin
  - Mirtazapine
  - Risperidone
  - Venlafaxine

- 54 A monoclonal antibody was tested in patients using the following dose ranges and resulted in the following  $t_{1/2}$  values:

<u>Dose</u>	<u>Half-life</u>
0.2 mg/kg	2 days
1 mg/kg	8 days
2 mg/kg	18 days
3 mg/kg	18 days
5 mg/kg	18 days

What is the reason for the dose-dependent  $t_{1/2}$ ? The biologic drug:

- eliminates primarily by the lymphatic system at lower doses.
- eliminates primarily by the liver resulting in nonlinear pharmacokinetics.
- eliminates by catabolism.
- distributes rapidly to peripheral organs at lower doses.
- exhibits target-mediated drug disposition.

- 55** Pravastatin inhibits:
- PCSK9 protein.
  - lipoprotein lipase.
  - vascular oxidative stress.
  - scavenger receptor function.
  - HDL synthesis.
- 56** In a manufacturing setting, which of the following methods is the most appropriate to use for sterilization of plastic (PVC) tubing?
- Dry heat
  - Steam autoclave
  - Ionizing radiation
  - Ethylene oxide gas
  - Filtration
- 57** What is the first process used when evaluating the integrity of a recombinant protein after each purification step?
- ELISA
  - Quantitative PCR
  - Peptide mapping
  - SDS-polyacrylamide gel electrophoresis
  - Amino acid sequencing
- 58** Which of the following types of neurotransmitter receptors is most responsible for the decreased risk of extrapyramidal side effects observed with some second generation antipsychotics relative to first generation antipsychotics?
- Serotonergic
  - Histaminergic
  - Muscarinic
  - Noradrenergic
  - Alpha-adrenergic
- 59** In tablets made from wet granulation processing, which of the following substances is commonly included as a lubricant?
- Lactose
  - Potato starch
  - Croscarmellose
  - Dicalcium phosphate
  - Sodium lauryl sulfate
- 60** Permeation enhancers increase drug absorption from buccal dosage forms by which of the following mechanisms?
- Decreasing drug solubility
  - Extracting oral mucosal lipids
  - Disrupting saliva secretion
  - Increasing drug particle size
  - Prolonging oral retention

- 61** Disintegration of a compressed tablet is primarily dependent upon which of the following properties of the tablet?
- a. Size
  - b. Shape
  - c. Hardness
  - d. Coating
  - e. Stability

**PHARMACY PRACTICE - Clinical Sciences**

**62** At typical dosing, which of the following antidepressant medications is associated with the highest incidence of nausea?

- a. Sertraline
- b. Fluoxetine
- c. Duloxetine
- d. Escitalopram
- e. Desvenlafaxine

**63** Which of the following statements is correct regarding the use of fluoroquinolones?

- a. Fluoroquinolones can cause blood glucose alterations in elderly patients who take oral antihyperglycemic medications.
- b. Healthy women with acute uncomplicated cystitis should be treated for a minimum of 7 days with a fluoroquinolone.
- c. Therapeutic drug monitoring is recommended with prolonged fluoroquinolone therapy, to avoid ototoxicity.
- d. In the case of treatment failure, another fluoroquinolone should be tried before switching to a different antibiotic class.
- e. All fluoroquinolones have equal efficacy when used to treat patients with community-acquired pneumonia.

**QUESTIONS 64 TO 65 INCLUSIVE REFER TO THE FOLLOWING:**

**SM is a 34 year old female who, while vacationing in Mexico, began prophylactic treatment for travellers' diarrhea. Shortly thereafter she complained of a feeling of fullness in her ears, black stools and a black tongue. SM's previous history includes an allergy to sulfonamides.**

**64** Which of the following drugs could be the cause of SM's complaints?

- a. Bismuth subsalicylate
- b. Cotrimoxazole (sulfamethoxazole/trimethoprim)
- c. Doxycycline
- d. Amoxicillin
- e. Loperamide

65 An organism commonly implicated in the cause of travellers' diarrhea is:

- a. Bacteroides fragilis.
- b. Escherichia coli.
- c. Clostridium difficile.
- d. Listeria monocytogenes.
- e. Pseudomonas aeruginosa.

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66 Which of the following medications requires monitoring for the adverse effect of dyslipidemia?

- a. Ciprofloxacin
- b. Allopurinol
- c. Isotretinoin
- d. Ramipril
- e. Raloxifene

67 The mother of a 6 year old child presents to the pharmacist with a written prescription for amoxicillin that was ordered by the physician three days earlier. She states that her child was diagnosed with otitis media and the symptoms have remained the same over the past three days. Which of the following is the most appropriate pharmacist response?

- a. Fill the prescription as written
- b. Refuse to fill the prescription as the antibiotic order is no longer current
- c. Indicate a need to contact the prescriber before filling the prescription at this time
- d. Fill the prescription for a quantity that is the ordered amount less three days' supply
- e. Explain that, at this late date, antibiotic therapy will likely be ineffective for the child

68 RF is an 80 year old female who developed CDAD (Clostridium difficile-associated diarrhea) after recent treatment of a urinary tract infection with ciprofloxacin. She is admitted to hospital with profound diarrhea (eight watery bowel movements per day) and fever (39.5° C). Based on her symptoms, which of the following is the most appropriate therapy choice for her?

- a. Oral metronidazole
- b. Intravenous metronidazole
- c. Oral cholestyramine
- d. Oral vancomycin
- e. Intravenous vancomycin

69 CC, a 72 year old female, complains to the pharmacist that her stomach has been bothering her recently. Current medications include: levothyroxine 100 mcg po daily (x 30 years), acetaminophen 500 mg po qid (x 5 months), atorvastatin 40 mg po at bedtime (x 4 years), ibuprofen 400 mg po tid prn joint pain (x 2 months), and zopiclone 3.75 mg po at bedtime prn (x 3 months). Based on CC's current symptoms, which of the following drug therapy problems best describes CC's current situation?

- a. Too high a dosage of atorvastatin
- b. Too high a dosage of zopiclone
- c. Need for cytoprotection with ibuprofen
- d. Drug interaction between atorvastatin and zopiclone
- e. Too low a dosage of levothyroxine

- 70** A 27 year old patient presents to a community pharmacy for the first time and tells the pharmacist that he experienced an allergy to a penicillin product as a child. His symptoms included hives, wheezing and facial swelling, which resulted in hospitalized care. Which of the following is the most important reason for a community pharmacist to document this type of information in a patient's medication profile record?
- To provide drug allergy information to the patient's insurance provider.
  - To encourage the patient to fill future prescriptions at this pharmacy.
  - To advertise relevant pharmacy products or services to appropriate patients.
  - To enhance continuity of patient care regardless of the prescriber.
  - To provide a record of cognitive services for insurance reimbursement.

**QUESTIONS 71 TO 72 INCLUSIVE REFER TO THE FOLLOWING:**

**TK is a 63 year old male with chronic kidney disease (CrCl = 29 mL/min/1.73m<sup>2</sup>) and gout. He experienced his last gout attack about two months ago. Today his toe is extremely painful, hot, red, and swollen. At a walk-in clinic, he receives a prescription for naproxen 500 mg po bid for five days. TK's other current medication is pravastatin 20 mg po at bedtime.**

- 71** What drug therapy problem should the pharmacist identify for TK?
- Naproxen is inferior to indomethacin for the treatment of acute gout.
  - The duration of naproxen treatment is too short.
  - Naproxen should be avoided in patients taking pravastatin.
  - Naproxen should be avoided in patients with renal dysfunction.
  - The frequency of naproxen dosing is too low.
- 72** Following successful resolution of the acute episode, TK's physician decides that he should initiate allopurinol. TK should be advised to:
- limit fluid intake.
  - take medication on an empty stomach.
  - use precautions to avoid photosensitivity.
  - report any skin rash or itching to the physician.
  - avoid dairy products or multivitamins within 2 hours of dose.

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- 73** All of the following have been implicated in causing toxic nephropathy, **EXCEPT**:
- cyclosporine.
  - sulfonamides.
  - cisplatin.
  - penicillamine.
  - erythromycin.
- 74** In the treatment of a patient who has a solid tumour, which of the following side effects typically occurs one to two weeks after chemotherapy?
- Neuropathy
  - Cardiotoxicity
  - Neutropenia
  - Emesis
  - Nephrotoxicity

- 75** Lactose intolerance is classified as a(n):
- allergy.
  - enzyme deficiency.
  - mineral deficiency.
  - transporter abnormality.
  - vitamin deficiency.
- 76** A community pharmacist conducts a medication review for a 67 year old patient who has a 20-year history of COPD, diabetes and depression. The patient's current medications include the following:
- Acclidinium 400 mcg inhaler, one inhalation bid
  - Budesonide 200 mcg/formoterol 6 mcg Turbuhaler®, 2 inhalations bid
  - Salbutamol 100 mcg MDI, 2 inhalations qid
  - Sitagliptin 100 mg, one tablet po daily
  - Metformin 500 mg, one tablet po tid
  - Venlafaxine ER 150 mg, one capsule po at bedtime
- Which of the following drug therapy problems should be identified for this patient?
- Taking too high a dosage of acclidinium
  - Taking too high a dosage of metformin
  - Inappropriate dosing time for venlafaxine
  - Drug interaction between sitagliptin and metformin
  - Duplication of therapy with salbutamol and formoterol
- 77** Which of the following is characterized as an autoimmune disorder?
- Alzheimer disease
  - Systemic lupus erythematosus
  - Osteoarthritis
  - Parkinson disease
  - Paget disease
- 78** A pregnant female presents with a prescription for an antibiotic for treatment of a urinary tract infection. She tells the pharmacist that she doesn't know why the doctor gave her the medication, because she isn't experiencing any symptoms. Her presentation is consistent with which of the following diagnoses?
- Cystitis
  - Septicemia
  - Urinary retention
  - Pyelonephritis
  - Asymptomatic bacteriuria
- 79** A community pharmacist would like to begin a diabetic education program for local patients newly diagnosed with type 2 diabetes mellitus. Beneficial information for this group includes all of the following **EXCEPT**:
- strategies to minimize cardiac risk factors.
  - the facts on diabetes and its complications.
  - the role of blood glucose monitoring.
  - appropriate dietary recommendations.
  - the technique for the mixing of insulins.



- 80** Which of the following would be the most appropriate treatment for moderate to severe atopic dermatitis in an 8 year old child?
- Urea 20% cream
  - Tacrolimus 0.03% cream
  - Pimecrolimus 1% cream
  - Betamethasone dipropionate 0.05% ointment
  - Clobetasone propionate 0.05% cream
- 81** Which of the following is a normal host defence that helps to prevent pneumonia?
- Low sputum pH
  - Aspiration
  - Thick, tenacious sputum
  - Neutropenia
  - Epiglottal closure
- 82** Tadalafil is preferred over sildenafil in which of the following patient situations?
- After using sublingual nitroglycerin
  - After eating a high-fat meal
  - If receiving hemodialysis
  - If taking testosterone supplementation
  - For males over the age of 60 years
- 83** Which of the following vitamins is found at reduced levels in cigarette smokers compared to nonsmokers?
- Vitamin A
  - Vitamin B<sub>12</sub>
  - Vitamin C
  - Vitamin D
  - Vitamin K
- 84** Which of the following is a reasonable goal of therapy for a patient with active inflammatory bowel disease?
- Prevent infection
  - Prevent mortality
  - Maintain quality of life
  - Achieve endoscopic remission
  - Limit the number of colectomies
- 85** BC is a 25 year old female with depression who has had an adequate trial with each of sertraline and escitalopram. She has tolerated the medications but has only achieved a partial response to escitalopram 20 mg po once daily. Which of the following is the most appropriate next step for BC?
- Increase escitalopram to 40 mg po once daily
  - Add diazepam 5 mg po once daily to escitalopram
  - Add aripiprazole 2 mg po once daily to escitalopram
  - Stop escitalopram and start fluoxetine 20 mg po once daily
  - Stop escitalopram and start venlafaxine XR 150 mg po once daily

## **PHARMACY PRACTICE – Professional Practice Skills**

- 86** Which of the following is **NOT** a benefit of performing medication reconciliation activities in a hospital setting?
- Reduction of medication errors
  - Reduction of inventory pilferage
  - Reduction of preventable adverse effects
  - Assessment of patient adherence to therapy
  - Enhanced accuracy of patient allergy information
- 87** The web site of which of the following would be most appropriate to consult in order to determine whether there are any safety alerts associated with a prescription drug product?
- Canadian Agency for Drugs and Technologies in Health
  - Health Canada
  - Institute for Safe Medication Practices
  - Canadian Patient Safety Institute
  - Canadian Institute for Health Information
- 88** In dispensing, the Latin abbreviation for "before meals" is:
- ac.
  - aa.
  - pc.
  - ic.
  - cc.
- 89** In dispensing, the English meaning for the Latin phrase "ex aqua" is:
- with or in water.
  - extracellular fluids.
  - exact amount.
  - soluble in water.
  - out of water.
- 90** Aerosol OT (AOT) is used in veterinary medicine as a laxative. If 250 g of AOT is dissolved in 1 000 mL of glycerin (density of glycerin is 1.25 g/mL), the concentration of AOT in the solution is:
- 12.5% w/w.
  - 16.7% w/w.
  - 20% w/w.
  - 23.8% w/w.
  - 25% w/w.
- 91** Appropriate quality control procedures to ensure product and patient safety in the pharmacy do **NOT** include which of the following?
- Adhering to guidelines for cold chain management
  - Maintaining a regular cleaning schedule for dispensary surfaces
  - Cleaning counting trays and automated counting machines regularly
  - Using TALLman lettering on all prescription labels
  - Regulating the pharmacy's indoor climate where medications are stored

- 92** Which of the following statements is correct regarding the MedlinePlus web site for drug information? The service:
- provides a compilation of clinical practice guidelines for health care professionals.
  - provides systematic reviews that are based solely on evidence from primary studies.
  - has an emphasis on providing patient/consumer information on a wide variety of health topics.
  - is limited by its availability only through paid subscription by health care professionals.
  - is limited by a lag to publication and updating of patient therapy-related information.
- 93** The pharmacist fills a prescription for sumatriptan 100 mg tablets for a migraine patient. Appropriate information to provide to the patient includes which of the following?
- If the sumatriptan does not relieve the headache within four hours, ergotamine may be used.
  - If no relief is achieved in two hours, sumatriptan may be repeated.
  - If the headache is relieved but another headache occurs eight hours later, sumatriptan may be used for the second headache.
  - The maximum dosage in any 24-hour period is six tablets.
  - If relief is not achieved, no other medication can be used for 24 hours.
- 94** Which of the following medications requires an auxiliary label regarding avoiding the consumption of grapefruit or grapefruit juice?
- Felodipine
  - Amlodipine
  - Levetiracetam
  - Divalproex
  - Gabapentin
- 95** The recommended pediatric dosage for azithromycin therapy is 12 mg/kg po once daily on Days 1 through 5. For a child weighing 8.3 kg, calculate the total volume needed for the total course of treatment, if a product supplying 200 mg/5 mL is supplied for this order.
- 12.5 mL
  - 15 mL
  - 25 mL
  - 37.5 mL
  - 50 mL
- 96** A pharmacist is making a presentation on medication adherence to a group of clients. Which of the following would be the most appropriate indicator of the effectiveness of the presentation for these clients?
- Increase in fill quantity for each prescription refill
  - Reduced number of prescriptions filled per month
  - Increase in number of nonprescription medications used
  - Reduced number of prescription refill dates per month
  - Prescription refill dates closer to expected fill intervals

**97** R<sub>x</sub> Timolol 0.25 % drops

Mitte : 15 mL

Sig: gtt. i o.d. bid

On the prescription label the instructions to the patient should read:

- a. apply one drop into both eyes twice daily.
- b. instil one drop into the left eye twice daily.
- c. instil one drop into the right eye twice daily.
- d. shake well and instil one drop into the left eye twice daily.
- e. shake well and instil one drop into the right ear twice daily.

**98** According to ISMP guidelines, which of the following medication orders contains a dangerous abbreviation or dosing designation?

- a. Insulin NPH 10 units subcut at bedtime
- b. Oxycodone CR 40 mg po q12h
- c. Gliclazide 80 mg po bid
- d. MTX 7.5 mg po weekly
- e. Levothyroxine 88 mcg po daily

**99** Which of the following statements is correct regarding Tylenol Elixir With Codeine<sup>®</sup> (each 5 ml contains acetaminophen 160 mg and codeine 8 mg)?

- a. It requires a written order from an authorized prescriber.
- b. It is an example of a legally exempted codeine product.
- c. Sale for self-medication use must involve a pharmacist.
- d. It is regulated under the Benzodiazepines and Other Targeted Substances Act.
- e. Authorized prescribers include chiropractors.

**100** A physician wants to switch a terminally-ill patient from slow release morphine sulfate tablets, 15 mg tablets. If a morphine sulfate solution containing 5 mg per mL is prescribed q4h, what volume should be dispensed for a 20 day supply to provide the same pain relief as the tablet regimen?

- a. 20 mL
- b. 60 mL
- c. 80 mL
- d. 100 mL
- e. 120 mL

**101** A biological safety cabinet is required when preparing a parenteral formulation of:

- a. tenecteplase.
- b. doxorubicin.
- c. magnesium sulfate.
- d. nitroglycerin.
- e. penicillin.

**102** Which of the following drug orders is incomplete and requires follow-up with the prescriber?

- a. Zithromax Z-Pak<sup>®</sup> (azithromycin 250 mg), 2 tabs po on day 1 and 1 tab po on days 2-5.
- b. Flonase<sup>®</sup> (fluticasone) 100 mcg spray, 1 or 2 sprays in each nostril bid x 1 bottle
- c. Actonel<sup>®</sup> (risedronate), 35 mg po once weekly x 12 tabs
- d. Cozaar<sup>®</sup> (losartan), 50 mg po bid x 1 month
- e. Zocor<sup>®</sup> (simvastatin), 1 tab po hs for 3 months

**103** JN, a 17 year old male with a highly resistant form of testicular cancer, is in hospital for treatment. He is an intelligent, articulate young man. His parents are insisting that the physician treat him with the latest experimental therapy, but JN does not want to undergo the treatment. If the physician goes ahead and gives the experimental therapy what ethical principle will have been violated the most?

- a. Confidentiality
- b. Nonmaleficence
- c. Justice
- d. Veracity
- e. Autonomy

**104** Which of the following statements is correct regarding hypothesis testing?

- a. A type I error frequently occurs when sample sizes are small.
- b. A type II error is more serious than a type I error.
- c. Small p-values suggest that the null hypothesis is likely to be true.
- d. The larger the p-value, the more likely the null hypothesis is false.
- e. P-value is the probability of wrongly rejecting the null hypothesis if it is in fact true.

**105** An adequately powered, randomized controlled trial conducted over two years demonstrated that the primary outcome (a serious cardiovascular event) occurred in 15% of the patients who received the new drug, whereas the primary outcome occurred in 25% of the patients who received a placebo. The relative risk reduction achieved with the new drug is:

- a. 10%.
- b. 15%.
- c. 25%.
- d. 40%.
- e. 50%.

**106** In an adequately powered, randomized controlled trial conducted over three years, a specific serious side effect (i.e., reduction in leukocytes) with conventional therapy is seen in 0.5% of the study sample. In patients who receive a newly discovered drug, only 0.45% experience the same side effect. Based on these results, the minimum number of patients that would have to receive the new drug for three years to statistically demonstrate the prevention of one episode of this side effect in at least one patient is:

- a. 15.
- b. 20.
- c. 150.
- d. 200.
- e. 2000.

**107** In a study comparing two drug treatment regimens, a type II error occurs when:

- a. the statistical conclusion is that there is a difference between the two treatment regimens when a difference does not actually exist.
- b. the statistical conclusion is that there is no difference between the two treatment regimens when a difference actually does exist.
- c. the p level is  $> 0.05$ .
- d. the drug treatments studied are not appropriate comparators for the disease.
- e. the exclusion criteria are too restrictive.

**108** A pharmacist has received information regarding a new drug to treat hypertension. The information is based on a two-month, placebo controlled, randomized study of 1000 adults that showed a statistically significant average decrease in systolic pressure from 160 mm Hg to 141 mm Hg and in diastolic pressure from 98 mm Hg to 86 mm Hg. The most common adverse reactions were stomach upset and dizziness. Which of the following is the most significant limitation of this study?

- a. The study size was too small to assess efficacy.
- b. The patients did not achieve guideline targets for hypertension.
- c. Blood pressure is a surrogate outcome.
- d. Long term safety and efficacy were not assessed.
- e. Placebo is not an appropriate comparator.

**109** Part G of Canada's Food and Drug Regulations deals with which of the following?

- a. Vitamins and minerals
- b. Pharmaceuticals
- c. Controlled Drugs
- d. Benzodiazepines and Targeted Substances
- e. Narcotic Preparations

**110** Which of the following is a significant barrier perceived by physicians, that impedes effective pharmacist-physician collaboration in the provision of patient care?

- a. Provision of patient-specific counselling by pharmacists
- b. Lack of adequate education and training of pharmacists
- c. Lack of pharmacist follow up in assessing patient outcomes
- d. Increased patient demands for more frequent medical appointments
- e. Interruption of physician workflow due to pharmacist communications

- 111** Which of the following statements regarding a disruption in the cold chain for vaccines is correct?
- Vaccines exposed to temperatures above the recommended range can have an increase in potency and should not be administered to any patient.
  - Vaccines exposed to temperatures below the recommended range should be labelled “do not use” and kept at room temperature until their integrity is determined.
  - Inactivated vaccines are more likely than live attenuated vaccines to have a shortened half-life when exposed to high temperatures (up to 37° C).
  - Diluents of vaccines that have been frozen can be used as they do not contain any active ingredients.
  - Vaccines containing an aluminum adjuvant experience a permanent loss of potency when subjected to freezing.

**BEHAVIOURAL, SOCIAL AND ADMINISTRATIVE PHARMACY SCIENCES**

**112** In deciding what drugs are appropriate for its formulary, the hospital must consider a drug’s efficacy, associated workload, and acquisition cost. Several new antifungal IV drugs (drug A, drug B, drug C, and drug D), all with equal efficacy, have recently become available. Currently the hospital stocks drug E, which has been available for several years. Data for the medications is as follows:

Drug	Cost/Day	Dosing Frequency	Treatment Duration (days)
A	\$2.50	qid	14
B	\$2.25	once daily	14
C	\$5.00	bid	7
D	\$2.25	bid	7
E	\$2.25	qid	7

The most appropriate choice for the hospital is:

- Drug A.
  - Drug B.
  - Drug C.
  - Drug D.
  - Drug E.
- 113** Which financial statement could be used to determine the total value of prescription drug sales for a pharmacy during the course of a year?
- Balance sheet
  - Statement of investments
  - Statement of changes in financial position
  - Income statement
  - Statement of equity
- 114** The standard of universal access to government insured health care in Canada is mandated by:
- the Canada Health Act.
  - individual provinces and territories.
  - Health Canada’s Health Environment and Consumer Safety directorate.
  - Canadian Agency for Drugs and Technologies in Health
  - Public Health Agency of Canada.

**115** Which of the following responsibilities can be appropriately delegated to a non-pharmacist manager of a community pharmacy?

- a. Purchasing narcotic drugs
- b. Selecting clinical decision software for the dispensary computer
- c. Coordinating staff scheduling
- d. Supervising pharmacy technicians
- e. Determining workflow for the pharmacy's professional services

**116** Academic detailing by pharmacists provides a service to physicians by:

- a. educating on improved prescription legibility.
- b. advising on optimal patient interviewing techniques.
- c. recommending strategies to avoid medication wastage.
- d. providing current information on best prescribing practices.
- e. promoting the use of physician samples given to patients.

**117** A role of The National Association of Pharmacy Regulatory Authorities is to:

- a. audit the financial performance of provincial pharmacy licensing bodies.
- b. promote harmonization of pharmacy practice standards across Canada.
- c. establish a unified lobby voice for pharmacists from all types of practice settings.
- d. provide mechanisms for the public to file complaints about pharmacy care providers.
- e. accredit the pharmacy programs at Canadian universities

**118** The term 'perspective' in the context of a pharmacoeconomic study refers to the:

- a. source of funding for conducting the pharmacoeconomic analysis.
- b. approach the researcher takes to analyze the research problem.
- c. approach the researcher uses to limit confounding factors.
- d. stakeholder whose interest is most represented in the study's conclusions.
- e. method used to facilitate communication of the study results in a journal publication.

**119** Which of the following would be the most effective method to prevent "inventory shrinkage" due to internal theft within a pharmacy?

- a. Assigning the responsibility of ordering and receiving of inventory to one employee.
- b. Implementing an employee bag check program at the end of shifts.
- c. Hiring a uniformed security guard to monitor the pharmacy exits.
- d. Offering incentives such as employee discounts on merchandise.
- e. Installing mirrors and security cameras strategically throughout the pharmacy.

**120** In the context of a pharmacy business, which of the following groups represent a market niche, rather than a market segment?

- a. Women
- b. The elderly population
- c. Children with asthma
- d. High-income earners
- e. Parents of young children



**121** An identical screening test for a disease is used in two Communities (A and B), but the proportion of false positive results among those who test positive in Community A is lower than those who test positive in Community B. What is the most likely explanation for this finding?

- a. The specificity of the test is lower in Community A.
- b. The specificity of the test is higher in Community A.
- c. The prevalence of disease is lower in Community A.
- d. The prevalence of disease is higher in Community A.
- e. It is not possible to explain the difference between Community A and B.

**122** “Medically necessary” services are established in Canada by the:

- a. provincial governments.
- b. provincial drug plans.
- c. Canadian Medical Association.
- d. federal government.
- e. Royal College of Physicians and Surgeons of Canada.

**123** Including a cost assessment in the protocol for a randomized, controlled clinical trial is called a:

- a. cost-benefit analysis.
- b. cost-minimization analysis.
- c. cost-effectiveness analysis.
- d. cost-efficacy analysis.
- e. cost-utility analysis.

**124** The best study design to assess intermittent or transient drug exposures is a:

- a. case-control study.
- b. retrospective cohort study.
- c. randomized control study.
- d. case-crossover study.
- e. cross-sectional study.

**125** Customer loyalty should be important to a pharmacy manager because it:

- a. reduces the amount of time that pharmacists must spend with patients.
- b. generates a stream of high revenue from an identifiable customer base.
- c. helps the pharmacy staff to greet customers by their first names.
- d. protects the pharmacy manager from liability claims arising from dispensing errors.
- e. is costly to attract new customers.

## Answers to Sample Questions

1. (d)	26. (d)	51. (c)	76. (e)	101. (b)
2. (c)	27. (c)	52. (e)	77. (b)	102. (e)
3. (a)	28. (c)	53. (c)	78. (e)	103. (e)
4. (a)	29. (d)	54. (e)	79. (e)	104. (e)
5. (e)	30. (b)	55. (c)	80. (b)	105. (d)
6. (b)	31. (b)	56. (d)	81. (e)	106. (e)
7. (a)	32. (c)	57. (d)	82. (b)	107. (b)
8. (d)	33. (a)	58. (c)	83. (c)	108. (d)
9. (a)	34. (c)	59. (e)	84. (d)	109. (c)
10. (a)	35. (a)	60. (b)	85. (c)	110. (e)
11. (c)	36. (d)	61. (c)	86. (b)	111. (e)
12. (a)	37. (e)	62. (a)	87. (b)	112. (d)
13. (c)	38. (c)	63. (a)	88. (a)	113. (d)
14. (a)	39. (a)	64. (a)	89. (a)	114. (a)
15. (c)	40. (a)	65. (b)	90. (b)	115. (c)
16. (d)	41. (a)	66. (c)	91. (d)	116. (d)
17. (d)	42. (c)	67. (a)	92. (c)	117. (b)
18. (a)	43. (c)	68. (d)	93. (c)	118. (d)
19. (a)	44. (c)	69. (c)	94. (a)	119. (b)
20. (b)	45. (b)	70. (d)	95. (a)	120. (c)
21. (b)	46. (b)	71. (d)	96. (e)	121. (d)
22. (a)	47. (d)	72. (d)	97. (c)	122. (a)
23. (c)	48. (d)	73. (e)	98. (d)	123. (d)
24. (d)	49. (c)	74. (c)	99. (a)	124. (d)
25. (e)	50. (a)	75. (b)	100.(e)	125. (e)