AAVSB VTNE - Quiz Questions with Answers

1. Pharmacy and Pharmacology

1.

What is a common side effect of corticosteroid administration?

- **Delayed wound healing**
- Decreased thirst and urination
- Lowered risk of diabetes mellitus
- Increased inflammation

Correct answer: Delayed wound healing

While glucocorticoids (corticosteroid medications) can be extremely effective at reducing inflammation, there are risks associated with long-term use and/or high doses. Side effects include delayed wound healing, polyuria (increased urination), and polydipsia (increased thirst). Steroid use is also associated with an increased risk of diabetes mellitus.

2.

"Tablespoon" is commonly used in dosing over-the-counter medications. How many milliliters are in one tablespoon?

- **15 mL**
- 5 mL
- 50 mL
- 500 mL

Correct answer: 15 mL

One tablespoon is equal to 15 milliliters. To convert tablespoons into milliliters, multiply the dose in tablespoons by 15.

There are 3 teaspoons in 1 tablespoon. One teaspoon is equal to 5 milliliters.

3.

A veterinarian prescribes amphotericin B to treat a patient's severe Histoplasma fungal infection. Which organ is at the **highest** risk of serious adverse effects?

- **Kidney (nephrotoxicity)**
- Liver (hepatotoxicity)
- Blood cells (bone marrow failure)
- Eye (vision loss)

Correct answer: Kidney (nephrotoxicity)

Amphotericin B carries life threatening risks of nephrotoxicity to the kidneys.

Toxicity to the liver, bone marrow, or eyes is not recognized with this medication.

4.

A client receives a recommendation for her dog to receive Apoquel daily for treatment of atopic dermatitis. She wants to price check what she should expect to spend for three months (90-day supply) of treatment. The 16 mg tablets cost $1.17 each for the hospital. The business marks up products 2.5 fold for the price charged to the client. The dog's prescription is for 1/2 tablet by mouth once daily.

How much is the financial estimate to the client for this course of therapy?

$131.62

$52.65

$105.30

$263.24

Correct answer: $131.62

Calculate number of tablets needed: (1/2 tablet per day) x (90 day supply) = 45 tablets

Calculate cost to practice: 45 tablets x ($1.17/tablet) = $52.65 cost to practice

Markup cost to client: $52.65 x 2.5 mark up = $131.62

5.

Patients with diabetic ketoacidosis are frequently placed on insulin continuous rate infusions. The veterinarian's orders are for 2.2 U/kg of regular insulin (U-100) to be added to a 250 mL bag of 0.9% NaCl, beginning administration at 10 mL/hr. The patient weighs 25 pounds.

What is the volume of insulin to add to the fluid bag?

0.25 mL

1 mL

0.5 mL

2.5 mL

Correct answer: 0.25 mL

Convert the patient's weight from pounds to kilograms: 25 pounds / (2.2 pounds per kilogram) = 11.4 kg

Calculate the dose in units: 11.4 kg x (2.2 U/kg) = 25 units

Convert units to volume: U-100 insulin is 100 units per ml concentration. 25 units / (100 units/ml) = 0.25 mL

6.

A 40-kg dog needs to receive IV fluids at 66 ml/kg/d. There are no fluid pumps available so the drip rate needs to be calculated using a 10 drops/mL administration set.

How many drops should there be per 15 seconds?

- **4-5**
- 18-20
- 2
- 44

Correct answer: 4-5

Calculate the administration rate in mL/d: 40 kg x (66 mL/kg/d) = 2640 mL/d

Convert time downward in steps: (2640 mL/d) / (24 hr/d) / (60 min/hr) / 4 (there are 4 periods of 15 seconds per minute) = 0.458 mL per 15 sec

Convert mL to drops: 0.458 mL x (10 drops/mL) = 4.6 drops should be counted per 15 sec

7.

Fipronil is **most** commonly found in which of the following?

Flea and tick preventatives

Heartworm preventatives

Hookworm and roundworm preventatives

Tapeworm preventatives

Correct answer: Flea and tick preventatives

Fipronil is most commonly found in over-the-counter flea and tick preventatives. It is applied topically once monthly. As an environmental treatment, Fipronil is used to control fleas, ticks, ants, cockroaches, beetles, termites, thrips, weevils, rootworms, and mole crickets.

Fipronil is not an active ingredient in heartworm preventatives, hookworm and roundworm preventatives, or tapeworm preventatives.

8.

Which of the following medications used in sedation and anesthetic procedures must you maintain a controlled substance log for, properly recording all used and wasted volumes of the drug?

Butorphanol

Propofol

Etomidate

Dexmedetomidine

Correct answer: Butorphanol

Butorphanol is a mixed mu-opioid agonist. The most commonly used mixed opioid agonists in veterinary medicine include butorphanol (a class CIV) and buprenorphine (a class CIII), both of which are controlled. The pure mu agonists are CII (methadone, morphine, fentanyl, hydromorphone).

Etomidate and propofol are both short-acting injectable anesthetic drugs that are not federally controlled substances. However, many states or individual practices treat propofol as a controlled substance due to concerns about misuse and theft. While the drug is abused, it isn't associated with physical dependency, which is the criteria used by the Drug Enforcement Agency (DEA) to determine a medication's need to be controlled.

Dexmedetomidine is an alpha-2 agonist used for pain management, sedation, and other related uses. It is reversible but not a controlled substance.

9.

A farmer wants to treat his cattle herd with ivermectin pour-on. Your hospital stocks 1L bottles in a 5 mg/mL concentration. The dose is 1 mL per 22 pounds body weight. His cattle average 550 pounds each.

How many cattle will one bottle treat?

- **40**
- 200
- 25
- 80

Correct answer: 40

Calculate how much one animal will need: 550 pounds x (1 mL/22 pounds) = 25 mL/animal

Calculate how many 25 mL doses are in a 1 liter bottle (1000 mL): (1000 mL/bottle) / (25 mL/dose) = 40 doses

10.

If a drug is to be administered at 5 mg/kg, what is the correct dose for a 25-pound dog? (Round to the nearest whole number.)

57 mg

65.8 mg

75 mg

5 mg

Correct answer: 57 mg

Convert 25 pounds to kilograms. Since 1 kg equals 2.2 lbs, divide 25 lbs by 2.2 to get 11.36 kg.

At 5 mg per kg, the dose for an 11.36-kg dog is 11.36 kg × 5 mg/kg = 56.8 mg. The nearest whole number is 57 mg.

11.

What is a potentially significant side effect of acepromazine?

Hypotension

Hypovolemia

Hypoxia

Hyperventilation

Correct answer: Hypotension

Acepromazine is a tranquilizer that blocks alpha-1 adrenergic receptors, leading to peripheral vasodilation and hypotension. This is normally manageable in otherwise healthy patients.

Acepromazine does not change intravascular volume status to cause hypovolemia, depress respiration to cause hypoxemia, or increase the respiratory rate sufficiently to cause hyperventilation. However, horses may develop tachypnea secondarily to excitement, commonly seen in the species.

12.

Though not currently controlled by the DEA, which of the following medications may likely become controlled soon?

Xylazine

Dexmedetomidine

Gabapentin

Ketamine

Correct answer: Xylazine

Xylazine, an alpha-2 agonist, is used in animal medicine for sedation and analgesia, often in short procedures. It is reversible and commonly combined with additional drugs for multi-modal anesthesia/sedation and pain management. However, recently, it has shown up in the illicit drug market in combination with opioids such as fentanyl. It is not a drug approved for human use and is not currently scheduled under the DEA controlled substances regulations. Various states have passed regulations to control it, recognizing concerns for abuse and illicit use. It has been in the news since early 2023, and discussions are ongoing at the congressional level about controlling it.

Dexmedetomidine, also an alpha-2 agonist, is not controlled and is commonly used in small animal medicine. It hasn't to date been seen in the illicit drug market and remains non-controlled.

Gabapentin, a neuropathic pain management medication originally developed as an anti-seizure drug, is regulated by individual practices and in some states, but is not federally controlled by the DEA.

Ketamine, an NMDA receptor antagonist, is used for pain management, wind-up prevention/treatment, sedation, and as part of a multi-modal pain management/anesthetic protocol. It has been a controlled drug for years because of its use in the illicit drug field and its abuse potential. It is a Schedule III drug that has been regulated since 1999.

13.

A veterinarian asks you to dispense Clavamox®. These tablets are scored, suggesting halving the tablet is okay.

However, you must be sure to advise your client of all of the following, except:

Clavamox is light-sensitive and must be kept in the blister pack until use

Wrap the unused half of the tablet in the blister pack and put in a closed pill container

Make sure to use the remaining half of the tablet for the next dose

Storage of the tablets should be below a maximum of 77°F (25°C)

Correct answer: Clavamox is light-sensitive and must be kept in the blister pack until use

Because the tablets are scored, the drug amount is uniformly contained within each half, permitting splitting. Thus, if giving half of a tablet, we can feel comfortable that the pet is getting the correct mg per dose. However, upon opening the blister pack, the medication can degrade easily, meaning drug stability may be negatively affected by halving the tablet. We want to protect the tablet from the air and moisture to minimize this degradation.

Therefore, the best practice recommendation is to have the client put the unused portion back into the blister wrapping and put it in a sealed pill container. This will protect it from the air. Further, ensure clients are storing the tablets appropriately. They should not be refrigerated but should also not be kept in conditions at temperatures exceeding 77°F (25°C), such as outside, in a warm car, in a warm house, etc.

14.

What class of medication does bupivacaine fall into?

Local anesthetic

Opioid analgesic

Anesthetic induction agent

Calcium channel blocker

Correct answer: Local anesthetic

Bupivacaine provides local anesthesia by blocking sodium channels needed for nerve signal transmission. It is not effective topically.

Bupivacaine is not an opioid analgesic (butorphanol and buprenorphine, for example), anesthetic induction agent (such as propofol), or calcium channel blocker (such as amlodipine).

15.

A 20-pound puppy accidentally ingests an unknown amount of another pet's carprofen 25 mg tablets. Possible renal side effects begin at > 8 mg/kg.

How many tablets would the puppy have to have eaten to risk renal toxicity?

Just under 3 tablets

Approximately 6 tablets

Anything over 1.5 tablets

4.5 tablets

Correct answer: Just under 3 tablets

Convert the weight from pounds to kilograms: 20 pounds / (2.2 pounds/kg) = 9.1 kg

Calculate the toxic dose: 9.1 kg x (8 mg/kg) = 72.8 mg

Calculate number of tablets: 72.8 mg / (25 mg/tablet) = 2.9 tablets

16.

Loop diuretics exert their effects through the increased excretion of all **except** which of the following electrolytes?

All listed choices have increased excretion with loop diuretics.

Calcium

Potassium

Sodium

Correct answer: All listed choices have increased excretion with loop diuretics

Loop diuretics inhibit renal tubular resorption of certain electrolytes, including sodium, potassium, and calcium.

Extracellular fluid follows sodium, so these medications are effective at removing the excessive fluid in congestive heart failure patients.

17.

A veterinarian prescribes meds for a dog to go home after laparoscopic surgery for liver and GI biopsies. She wants you to get the medications ready to go home. She would like to send the dog home after administering an injection of pantoprazole intravenously, as the dog still has her catheter in place to lessen reflux and nausea and because the patient is due for her oral dose of omeprazole (but not yet eating) before traveling home. The dog received a dose of cefazolin perioperatively, and her last dose was about 30 minutes ago.

When giving this medication IV, all of the following are true, except:

The drug is compatible with midazolam

The dose is 0.7-1 mg/kg IV slow, over 15 minutes q 12 hours

The concentration of the drug is often diluted to 4 mg/ml

The drug is compatible with cefazolin

Correct answer: The drug is compatible with midazolam

Pantoprazole is a proton-pump inhibitor (PPI). It is used for its antacid benefits and is commonly used in patients with IBD, reflux-related conditions, esophagitis, and generalized GI upset. It is the injectable version of the oral drug omeprazole. It was initially prescribed once daily, but studies suggest that it should now be twice daily, and that has been reflected in the most recently published PDRs.

Pantoprazole is a human drug used off-label in animals. It is compatible with:

- *Ampicillin*
- *Cefazolin*
- *Ceftriaxone*
- *Dopamine*
- *Epinephrine*
- *Furosemide*
- *Opioids*
- *Potassium chloride*

However, it is incompatible with the following (i.e., it shouldn't be given IV in a line used to administer these drugs): dobutamine, esmolol, mannitol, midazolam, and various multivitamins. Solutions with zinc may also be incompatible, so watch which fluids you administer it with.

It is generally diluted to a 4 mg/ml solution when reconstituted. It should be given no faster than over two minutes, but is most commonly given over 15 minutes. It is dosed at 0.7-1 mg/kg IV q 12 hours, though most vets usually start at the higher dose.

18.

Which choice correctly describes a therapeutic use for albuterol?

Bronchodilation

Increase in gastrointestinal absorption

Antiemetic

Antimicrobial

Correct answer: Bronchodilation

Albuterol is a bronchodilator (dilates the airways), used most commonly to treat cough, asthma, and bronchospasm. It is typically administered by inhalation, but oral formulations are available.

Albuterol does not increase gastrointestinal absorption, work as an antiemetic (decrease nausea), or have antimicrobial (treats infections) properties.

19.

Under what circumstances would a technician be asked to reach for atipamezole?

Anesthetic/sedative reversal

To induce vomiting

Airway dilation

Local anesthesia

Correct answer: Anesthetic/sedative reversal

Atipamezole is an adrenergic receptor antagonist used to reverse the effects of the alpha-2 adrenergic agonist dexmedetomidine.

Apomorphine is an emetic. Terbutaline, Albuterol, or Aminophyline are examples of bronchodilators. Lidocaine is a local anesthetic.

20.

Which of the following anesthetic agents causes cardiovascular stimulation, rather than depression?

Ketamine

Xylazine

Morphine

Isoflurane

Correct answer: Ketamine

Animals anesthetized with ketamine may have stronger pulses or a rapid heart rate, even when under anesthesia. Adverse effects include respiratory depression, cardiac arrhythmias, and increased intracranial pressure.

Xylazine, morphine, and isoflurane cause cardiovascular depression, not stimulation.

21.

Which of the following correctly identifies the target and actions of luteinizing hormone (LH)?

Stimulates female ovulation and male testosterone production

Stimulates female ovarian follicular growth and male spermatogenesis

Stimulates thyroid production of T_3/T_4

Stimulates corticosteroid production by the adrenal cortex

Correct answer: Stimulates female ovulation and male testosterone production

Luteinizing hormone (LH) is a pituitary hormone of the anterior lobe that stimulates female ovulation and male testosterone production. LH is also responsible for the secretion of progesterone and the conversion of follicles to the corpus luteum.

Follicle-stimulating hormone (FSH) is a pituitary hormone of the anterior lobe that stimulates female ovarian follicle growth (oogenesis) and male spermatogenesis. It also stimulates the follicular cells to produce and secrete estrogens.

Thyroid-stimulating hormone (TSH) is a pituitary hormone of the anterior lobe that stimulates thyroid production of T_3/T_4. Thyroid hormone homeostasis occurs via the interactions among the hypothalamus, the thyroid and the anterior pituitary glands.

Adrenocorticotropic hormone (ACTH) is a pituitary hormone of the anterior lobe that stimulates corticosteroid production by the adrenal cortex.

22.

Which of the following drug classes does **not** have use in the treatment of heart failure?

Expectorant

Positive inotrope

Vasodilator

ACE inhibitor

Correct answer: Expectorant

Expectorant medications help clear viscous respiratory secretions by thinning the consistency. They have limited use in respiratory conditions.

The other three options are routinely used when treating heart failure:

- *ACE (angiotensin-converting enzyme) inhibitors modulate the renin-angiotensin-aldosterone system (RAAS) and promote vasodilation.*
- *Positive inotropes increase heart contraction strength. Examples include digoxin, epinephrine, or dobutamine.*
- *Vasodilators allow smooth muscle vascular relaxation which can decrease preload and afterload or help treat systemic high blood pressure. Examples include nitroprusside or nitroglycerin.*

23.

Bexagliflozin is the new oral diabetic agent recently approved for use in cats in the U.S. What is the mechanism of action for this drug?

SGLT2 inhibitor

Suflonylurea

Incretin mimetic

DPP4 Inhibitor

Correct answer: SGLT2 inhibitor

Bexacat™ or Bexagliflozin is a new oral diabetic drug recently approved by the FDA in the U.S. It is an SGLT2 inhibitor (sodium-glucose cotransporter-2). SLGT2 is present in the kidneys and is responsible for 97% of glucose resorption that would otherwise be excreted via micturition. SGLT1 works by reabsorbing glucose from the intestinal tract.

Inhibiting this transporter causes a dumping of sugar in the urine and prevents (hopefully) hyperglycemia, thereby preventing the secondary negative effects of diabetes.

However, the drug can only be used in cats who are not yet on insulin (and have never been on insulin). It will only work in cats who still produce their own insulin (type 2 diabetics). Usually, cats who are recently diagnosed as diabetic and are not ketotic are considered most likely to respond.

All other options are possible diabetic medications currently available in people but have either not been shown effective in cats or not yet been utilized/studied in cats. These other options include sulfonylureas, e.g., glipizide, incretin mimetics (glucagon-like peptide 1 or GLP-1 receptor agonist), e.g., Byetta® and Victoza®, or a DPP4 (dipeptidyl peptidase 4) inhibitor, e.g., Ozempic®. While sulfonylureas are oral, the other options are currently injectable. Thus, even if cats responded, it isn't as beneficial as an oral option. However, the frequency of administration may be less than with insulin.

24.

A veterinarian's protocol is to administer Euthasol at 2 mL per 10 pounds for the first 10 pounds, then 1 mL per 10 pounds of body weight thereafter.

How much Euthasol should be drawn for a 25-pound patient?

3.5 mL

2.5 mL

5 mL

3 mL

Correct answer: 3.5 mL

The veterinarian wants 2 mL for the first 10 pounds of body weight.

The veterinarian wants 1 mL per 10 pounds for the remaining body weight (25 pounds - 10 pounds = 15 pounds). 1 mL per 10 pounds, extrapolated to 15 pounds = 1.5 mL

To cover the 25 pounds of patient weight, 3.5 mL of Euthasol should be drawn.

25.

A 20-kg patient received 3 mL of hydromorphone. The stock vial label indicates the concentration is 2 mg/mL. There is concern that this was an overdose, so you are asked to calculate what dosage this patient received.

Which of the following doses administered is correct?

0.3 mg/kg

0.1 mg/kg

2 mg/kg

3 mg/kg

Correct answer: 0.3 mg/kg

Dosage is the quantity (either mL or mg) per body weight (kg).

3 mL of hydromorphone at 2 mg/mL concentration = 3 mL x 2 mg/mL = 6 mg

The patient weighs 20 kg, so the dosage would be: 6 mg/20 kg = 0.3 mg/kg

26.

Which of the following is considered a psychotropic medication?

Alprazolam

Digoxin

Chlorpheniramine

Furosemide

Correct answer: Alprazolam

Psychotropic medications affect the mental state of patients and potentially treat behavior problems. Alprazolam is a benzodiazepine. Benzodiazepines are fast-acting medications with a short duration. They are best used for predictable, anxiety-provoking situations.

Digoxin is a cardiac glycoside medication. Chlorpheniramine is a histamine antagonist medication, more commonly known as an antihistamine. Furosemide is a loop diuretic.

27.

Which of the following topical medications causes the patient's pupils to dilate in order to facilitate a more thorough ocular exam?

Atropine

Tobramycin

Proparacaine

Ketotifen fumerate

Correct answer: Atropine

Atropine causes dilation of the pupils by relaxing the pupillary sphincter muscle, which helps facilitate a more thorough ocular exam and control ciliary spasms of the eye, providing pain relief. When administered intravenously, atropine is also used to counteract organophosphate poisoning, prevent bradycardia, and slow a hypermotile gut. Finally, it provides pain relief. Other commonly used topical ophthalmic drops used for mydriasis (pupil dilation) include tropicamide and phenylephrine.

Tobramycin is an antibiotic used to treat bacterial eye infections. Proparacaine is a topical anesthetic used to numb the eye for procedures to facilitate examination of painful eyes. Ketotifen is an antihistamine used for allergic conjunctivitis.

28.

A 60-lb dog needs a 22 mg/kg dose of cefazolin. The technician has a 1g vial to reconstitute with 9.8 mL of sterile water to produce 10 mL of total volume.

What volume of reconstituted cefazolin will be administered for one dose?

6 mL

13.2 mL

2.7 mL

27 mL

Correct answer: 6 mL

Convert patient weight from pounds to kilograms: 60 lbs / (2.2 lbs/kg) = 27.27 kg

Calculate the patient dose in mg: 27.27 kg x (22 mg/kg) = 600 mg

Calculate the concentration of drug: 1 g (or 1000 mg) in 10 mL volume = 100 mg/mL

Convert mg of drug to ml: 600 mg / (100 mg/mL) = 6 mL

29.

Leuprolide acetate is a reproductive drug used to treat adrenal endocrinopathy in which of the following patients?

Ferrets

Cockatiels

Iguanas

Goats

Correct answer: Ferrets

Leuprolide acetate is a reproductive drug used in ferrets for the treatment of hyperadrenocorticism. Leuprolide is a synthetic analog of GnRH, which stops the production of sex hormones and symptoms associated with hyperadrenocorticism, such as pruritus and hair loss.

Leuprolide can be used to treat inappropriate egg-laying in cockatiels. Leuprolide may also be helpful in treating aggression in male iguanas. Leuprolide is not used in goats.

30.

You are asked to set up a diabetic dog's treatment sheet. The patient will be hospitalized overnight, at the least, because he is ketotic and not eating well. The veterinarian wrote down drug doses and frequency but not the amount of drug per dose. You are asked to complete the treatment sheet, and the veterinarian will double-check it to ensure it meets his needs. The dog's ultrasound suggested possible delayed gastric emptying, and the dog has had moderate reflux. The veterinarian will use metoclopramide and would like 0.5 mg/kg IV q 6 to 8 hours.

What is the maximum total daily mgs acceptable for this 61.6-lb patient?

56 mg

42 mg

92 mg

122 mg

Correct answer: 56 mg

61.6 lb = 2.2 kg/X

X= 28 kg

0.5 mg/kg x 28 kg = 14 mg per dose

If the pet receives the medication every six hours, this would be four times daily, making the total daily dose 56 mg.

If we only evaluated it every eight hours, or three times daily, the total dose would be 42 mg/day.

Forgetting to convert lbs to kg and multiplying 61.1 lbs by 0.5 mg results in 30.55 mg/dose x 3 daily doses of 91.65 mg. If dosed 4x daily, it would be 122.2 mg. However, if we used pounds, we would be overdosing the dog.

31.

A 44-lb mixed breed FS dog presents to the vet with lumbosacral pain and is being treated symptomatically for intervertebral disc disease. The dog is obese and has a 7.5/9 body condition score. For the NSAID calculations, the vet will use a weight closer to the dog's ideal body weight and wants you to round down. The dog had routine bloodwork within the past month that showed normal liver and kidney values.

The vet elects to prescribe:

1. Gabapentin 15 mg/kg PO q 8 hours x 14 days
2. Amantadine 5 mg/kg PO q 24 x 21 days
3. Carprofen 2.2 mg/kg PO q 12 hours with food x 14 days.

You are asked to dispense the medications. Which of the following would be the correct number of tablets/capsules to dispense to the client for each drug?

Gabapentin 300 mg x #42 capsules; Amantadine 100 mg tablets/capsules x #21; and Carprofen 75 mg #14 tablets

Gabapentin 600 mg x #42 capsules; amantadine 100 mg #14; Carprofen 100 mg #7

Gabapentin 300 mg x #42 capsules, amantadine 100 mg #21; Carprofen 25 mg # 42

Gabapentin 100 mg x #42 capsules, amantadine 100 mg #21; Carprofen 100 mg # 14

Correct answer: Gabapentin 300 mg x #42 capsules; Amantadine 100 mg tablets/capsules x #21; and Carprofen 75 mg #14 tablets

First, convert 44 lb to kg by dividing by 2.2: 44/2.2 = 20 kg.

For gabapentin, 15 mg/kg x 20 kg = 300 mg — it is 3 capsules daily for 2 weeks, or 42 capsules.

For amantadine, 20 kg x 5 mg/kg = 100 mg — it is once daily, so 21 tabs/capsules are needed. This medication helps with chronic pain to help minimize wind-up/central sensitization. Usually, using it in patients with longstanding pain helps improve overall pain management.

For carprofen (NSAID), we want to dose closer to the ideal body weight, so we will round down. 44 lbs/2.2 = 20 kg x 2.2 mg/kg = 44 mg every 12 hours. However, we

want to lower the dose, not round up, so we will do 1/2 of a 75-mg tablet (37.5 mg) every 12 hours. Thus, you would dispense 1 tablet per day x 14 days, hence 14 tabs.

The gabapentin dose range is wide and could be as high as 600 mg without an issue, but it wasn't what was prescribed by the veterinarian. Further, 300 mg is the correct mg. Still, if only 28 capsules were prescribed, it would only be for q 12-hour administration for 2 weeks, which would not last long enough if given every 8 hours.

The veterinarian wanted 21 days of the amantadine.

The veterinarian wants to round down the rimadyl dose and treat for 2 weeks. We could do 1.75 of the 25 mg tablets to get the dose at the current weight, but again, the vet would like the dose lower because of obesity and to be liver and kidney-sparing.

32.

Which of the following describes the intended action of chemotherapy drugs?

Kill cells and/or microorganisms

Reverse the effect of another substance

Bind to and activate a receptor to produce a response

Suppress vomiting

Correct answer: Kill cells and/or microorganisms

A chemotherapy drug (antineoplastic agent) kills cells. The term is most commonly thought of when referring to cancer medications. They attack cells by 5 different mechanisms of action and include some antimicrobials. Examples include vincristine (cancer, plant alkaloid) and doxorubicin (antibiotic).

Antagonist drugs reverse the effects of other substances. Agonist drugs bind to and activate receptors to produce specific responses. For example, hydromorphone is an agonist at opioid receptors and naloxone is its antagonist. Antiemetic drugs suppress vomiting and can work on the nervous system (centrally) and/or gastrointestinal tract (peripherally). Examples include maropitant and metoclopramide.

33.

How do you convert pounds to kilograms?

Divide weight in pounds by 2.2

Divide weight in pounds by 3.14

Multiply weight in pounds by 3.14

Multiply weight in pounds by 2.2

Correct answer: Divide weight in pounds by 2.2

To convert pounds to kilograms, divide the weight in pounds by 2.2, since one kilogram is equal to 2.2 pounds. Kilograms are the most commonly used unit in dosage calculations.

1 kg = 1,000 g = 2.2 lb

34.

A farmer is having an outbreak of shipping fever in his cattle herd weighing approximately 800 pounds each. On the advice of the veterinarian, he administered Excenel (50 mg/mL ceftiofur for injection) at 1.5 mL per 100 pounds body weight once daily for three days. There is a four-day meat withdrawal time with this medication. The cattle first showed signs of illness on March 1, and he first treated the herd on March 2. Some do not respond to treatment, and the farmer wants to know the soonest they can go for slaughter processing.

What is your response?

March 8

March 4

March 6

March 10

Correct answer: March 8

Drug withdrawal times for slaughter are not dependent on dose received or body size, but by FARAD (Food Animal Residue and Avoidance Databank) for the specific drug.

If the cattle received injections on March 2, 3, and 4, they then have to wait four additional days from the final dose (March 4) for pre-slaughter withdrawal time. In this scenario, the first date available would be March 8.

35.

In the dispensing of veterinary medications, what does the abbreviation "b.i.d." mean?

Give twice daily (or every 12 hours)

Give three times daily (or every 8 hours)

Give once daily (or every 24 hours)

Give the medication by mouth

Correct answer: Give twice daily (or every 12 hours)

Veterinary technicians should be familiar with the most commonly used Latin terms in prescription writing. The Latin term "b.i.d." stands for "bis in die," meaning twice in a day. However, for written prescriptions to be filled elsewhere, it is recommended that these abbreviations no longer be used. In human medicine, they now write out "every 12 hours" to minimize the risk of errors.

The abbreviation "t.i.d." means give three times daily (or every eight hours). The abbreviation "q.d." means give once daily (or every 24 hours). The abbreviation "p.o." means to give the medication by mouth.

36.

What is the fluid volume deficit in mL for a 40-pound patient when 10% dehydrated?

~1820 mL

~400 mL

~4000 mL

~182 mL

Correct answer: ~1,800 mL

Unit conversion factors to remember: 2.2 lb = 1 kg & 1000 mL = 1 L

1: Convert the patient's weight into kilograms. 40 lbs / 2.2 lbs per kg = 18.2 kg

2: Calculate ten percent of 18.2 kilograms. 0.10 x 18.2 = 1.82 kg

3: Both bodily and therapeutic fluids are considered to be 1 L volume fluid = 1 kg weight. So, to modify units of measure: 1.82 kg of fluid weight x 1 L/1 kg = 1.82 L of fluid volume

4: Convert liters to milliliters to match the unit of measure asked in the question: 1.82 L x 1000 mL/L = 1820 mL

37.

A veterinarian is treating a horse with acute colic. Which of the following medications can safely be administered?

All are routinely used

Detomidine (alpha-2 agonist)

Butorphanol (opioid)

Flunixin meglumine (NSAID)

Correct answer: All are routinely used

For acute colic pain, a combination of an alpha-2 agonist and an opioid can provide immediate relief for severe pain. Sedation is also helpful since many of these patients will have a nasogastric tube passed for treatment.

Flunixin meglumine (a non-steroidal anti-inflammatory pain medication) is administered for both analgesic and anti-inflammatory (endotoxemia) benefits.

38.

A 5-pound kitten needs metronidazole dosed at 15 mg/kg, administered twice daily for seven days. Tablets are available in 250 mg size. You have a fish-flavored liquid made for compounding medications and want to make a 100 mg/mL liquid.

How many tablets do you need to crush to make this compounded prescription?

Two

One

One and one-half

Three

Correct answer: Two

- *Convert pounds to kilograms: 5 pounds / (2.2 pounds/kg) = 2.27 kg*
- *Calculate how many mg total the kitten will need for the course of treatment: 2.27 kg x (15 mg/kg per dose) x (2 doses/day) x (7 days for treatment) = 477 mg*
- *Crush two 250 mg tablets to give 500 mg*

39.

Ampicillin for injection is produced in 1 gram vials of powder. How much sterile water should be added to produce a 100 mg/mL concentration?

~10 mL

~3.3 mL

~1 mL

~100 mL

Correct answer: ~10 mL

- *1 gram = 1000 mg of drug*
- *To produce a 100 mg/mL concentration, 1000 mg would need to be mixed in 10 mL of diluent*

There is a slight volume accounted for by the power so, to be exact, these vials are usually filled with 9.8 mL of sterile water to produce 10 mL total volume.

40.

When reconciling the controlled drug log for Euthasol in your avian/exotics practice, the total volume administered to 170 patients recorded is 85 mL. Your hospital uses standard tuberculin syringes that generate 0.05 mL of hub loss per draw.

How much Euthasol should still be in the 100 mL vial accounting for the volumes recorded as administered and hub loss?

6.5 mL

8.5 mL

2.0 mL

1.5 mL

Correct answer: 6.5 mL

Calculate amount of hub loss volume: (0.05 mL/draw) x 170 draws = 8.5 mL

Add hub loss volume to recorded volume total: 8.5 mL + 85 mL = 93.5 mL

Subtract used volume from starting volume: 100 mL - 93.5 mL = 6.5 mL

41.

Glycopyrrolate is which type of drug?

Anticholinergic

Anti-inflammatory

Antiemetic

Antihistamine

Correct answer: Anticholinergic

Glycopyrrolate inhibits the function of acetylcholine, making this drug part of the anticholinergic class of drugs. Its main use is to prevent and treat bradycardia from anesthetic drugs and vagal stimulation.

Glycopyrrolate does not have anti-inflammatory, antiemetic, or antihistamine effects.

42.

A hypoglycemic puppy needs 5% dextrose added to his intravenous fluids. Since he's so tiny, his orders are to make 100 mL total in a buretrol. You have a 250 mL bag of Normosol-R and 50% dextrose.

What should you put in the buretrol?

10 mL of 50% dextrose and 90 mL of Normosol-R

25 mL of 50% dextrose and 225 mL of Normosol-R

10 mL of 50% dextrose and 100 mL of Normosol-R

5 mL of 50% dextrose and 95 mL of Normosol-R

Correct answer: 10 mL of 50% dextrose and 90 mL of Normosol-R

To make 5% dextrose, you need to make a 1:10 dilution of the 50% dextrose, or have 10% of the total fluid volume be the 50% stock solution.

Since the total volume is 100 mL, 10% of this is 10 mL. Add 10 mL of 50% dextrose stock solution to the buretrol.

To make the full 100 mL volume, add 90 mL of Normosol-R.

43.

Horses that have been administered benzodiazepine tranquilizers may experience all **except** which of the following?

CNS excitement

Muscle fasciculations

Weakness

Mild ataxia

Correct answer: CNS excitement

While benzodiazepines reduce anxiety and sedate patients, negative side effects vary across species. Horses that have been administered benzodiazepine tranquilizers may experience mild ataxia, muscle fasciculations, and weakness, but, typically, they do not experience CNS excitement. Still, these drugs are not generally used in horses without a secondary medication, such as an alpha-2 agonist, because of ataxia and other signs.

Dogs tend to experience CNS excitement, fear, and anxiety when administered benzodiazepine tranquilizers alone.

44.

A patient's orders are to receive a fentanyl CRI at 5 mcg/kg/hr. Fentanyl comes in a 50 mcg/mL vial. The patient weighs 40 kg. The fentanyl will be administered via syringe pump and piggy-backed on crystalloid fluids.

What volume of fentanyl should be drawn into the syringe to provide the patient with a 6-hour supply?

24 mL

12 mL

4 mL

6 mL

Correct answer: 24 mL

Calculate the mcg the patient will need per hour: 40 kg x (5 mcg/kg/hr) = 200 mcg/hr

Multiply to calculate a 6-hour supply: 200 mcg/hr x 6 hrs = 1200 mcg per 6 hours

Convert mcg to mL: 1200 mcg / (50 mcg/mL) = 24 mL

45.

A newborn calf mineral supplement label states that it includes 125 mg/kg of iodine. An independent lab analysis reports the product as containing 200 ppm of iodine in the product. The producer wants to know how these compare.

Which statement is correct?

There is 1.6 times more iodine in the product per the lab than is stated on the label

The lab verifies the label as being accurate

The label states there is 1.6 times more iodine than the lab analysis

The lab says there is 8-fold too much iodine than should be in the product

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Correct answer: There is 1.6 times more iodine in the product per the lab than is stated on the label

Conversion factor to remember: 1 part per million = 1 mg/kg

To re-derive this conversion factor: 1 mg/kg = 0.001g/1000g. Multiply by 1,000/1,0000 = 1g/1,000,000g. Cancel out the units to achieve 1/1,000,000 or one part per one million.

The lab testing says there is 200, when there should only be 125, so 200/125 = 1.6 times more iodine in the product than is stated on the label.

46.

A teaspoon is a common unit of volume for human over-the-counter packaging of medications. How many milliliters are equivalent to one teaspoon?

5 mL

30 mL

15 mL

1 mL

Correct answer: 5 mL

One teaspoon is equivalent to 5 milliliters. Conversion: Multiply the number of teaspoons by 5 to obtain the number of milliliters.

One tablespoon is equivalent to 15 milliliters. One ounce is 29.6 milliliters.

47.

Ketamine is a medication that is used to induce and maintain anesthesia, primarily in large animal species. What drug schedule does ketamine fall within?

Schedule III

Schedule I

Schedule II

Schedule IV

Correct answer: Schedule III

Ketamine is a dissociative anesthetic and NMDA receptor antagonist. It has moderate to low physical and psychological abuse potential.

48.

How does a vasodilator treat heart failure?

Dilating blood vessels

Increasing central venous pressure

Increasing the workload of the heart

Reinforcing the musculature of the heart

Correct answer: Dilating blood vessels

Vasodilators treat heart failure by dilating blood vessels, allowing blood to flow forward more easily and increase vessel capacity.

Vasodilators reduce, not increase, central venous pressure and decrease, not increase, the overall workload of the heart muscle. Vasodilators do not directly reinforce the musculature of the heart.

49.

What is the shorthand pharmacy abbreviation used to direct the caretaker that a medication should be given by mouth?

p.o.

b.i.d.

p.r.n.

h.s.

Correct answer: p.o.

Veterinary technicians should be familiar with the most commonly used Latin terms in prescription writing. The Latin term "p.o." stands for "per os", meaning by mouth.

The abbreviation "b.i.d." means give two times daily (or every 12 hours). The abbreviation "p.r.n." means per required need, or give as needed. The abbreviation "h.s." means to give medication at the hour of sleep, or bedtime.

50.

Non-steroidal anti-inflammatory medications should **not** be administered concurrently with which of the following drug classes?

Corticosteroids

Sedatives

Antibiotics

Opioids

Correct answer: Corticosteroids

Non-steroidal anti-inflammatory drugs (NSAIDs) are known to carry the risk of adverse gastrointestinal side effects. When given concurrently with a corticosteroid, the risk of GI bleeding, ulceration, and/or perforation is significantly increased.

NSAIDs are frequently administered with opioids, sedatives, and antibiotics, especially in the perioperative period.

51.

A quick estimation for drug dosing during CPR (cardiopulmonary resuscitation) is to administer 1 mL of atropine per 20 pounds of body weight every 3-5 minutes. If a 60-pound dog receives three rounds of atropine administration, what total volume was administered to the patient?

9 mL

3 mL

6 mL

1 mL

Correct answer: 9 mL

Calculate volume per dose: 60 pounds / (20 pounds per 1 mL) = 3 mL/dose

Total amount over three doses: 3 mL/dose x 3 doses = 9 mL total

52.

A 24-ounce bird needs a 4 mg/kg dose of propofol. The propofol comes in 20 mL vials and has a 10 mg/mL concentration.

What is the weight of the bird in kilograms?

0.68 kg

1.5 kg

2.7 kg

0.96 kg

Correct answer: 0.68 kg

Convert ounces to pounds: 24 ounces / (16 ounces per pound) = 1.5 pounds

Convert pounds to kilograms: 1.5 pounds / (2.2 pounds/kilogram) = 0.68 kilograms

53.

A veterinarian orders tramadol (50 mg tablets): 100 mg PO BID PRN pain, #20. How would you explain these instructions to a pet owner?

Give two tablets orally every 12 hours (twice daily) as needed for pain

Give one tablet every 12 hours (twice daily) by mouth as needed until gone

Give one tablet every 12 hours

This is a pain medication that should be given twice a day for five days

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Correct answer: Give two tablets orally every 12 hours (twice daily) as needed for pain

It is essential to review every aspect of a prescription drug label when dispensing medication to a pet owner. Common terms should be used, not medical abbreviations.

Since the medication is a 50 mg tablet, two tablets are needed to achieve each full dose of 100 mg. The medical abbreviation "BID" means "two times a day," or every 12 hours. PO (Per Os) means "by mouth," which most owners will better understand as "orally." PRN (Per Required Need) indicates an as-needed basis for pain. #20 indicates the total number of tablets to be dispensed.

54.

You have a patient just diagnosed with immune-mediated thrombocytopenia (ITP). The platelet count is just above 10,000. Despite the dog being at high risk for spontaneous bleeding, the owner cannot afford hospitalization, and the emergency veterinarian wants to give the pet the best chance of improving. The dog will go home with prednisone, omeprazole, and doxycycline. The owner cannot afford the tick-testing panel. Thus, the dog will be treated prophylactically for possible tick-borne disease as an underlying cause. The vet plans to give a single injection of vincristine.

All of the following are true about the handling and safety/storage of this chemotherapeutic, except:

Once diluted, it remains stable for only 24 hours at room temperature

Store vials upright between 36-46°F (2-8°C)

Protect from light

Once diluted, it remains stable for seven days when refrigerated

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Correct answer: Once diluted, it remains stable for only 24 hours at room temperature

Studies show that dogs given a single dose of vincristine at 0.02 mg/kg IV bolus, in addition to starting steroids and doxycycline, have a faster increase in platelet levels than those who do not receive the injection. While it is often given to all patients with ITP, a dog who cannot be hospitalized should definitely receive it. However, it is a chemotherapeutic, and all care should be taken when handling, storing, and disposing of this drug. All staff should be properly trained on handling and disposing of this drug before being permitted to administer it.

The product needs to be protected from light and stored upright between 36-46°F (2-8°C). Once diluted, vincristine remains stable for two days at room temperature or seven days in the refrigerator.

55.

A veterinarian would like the following medications dispensed for a 6.5-kg Maine Coon: Revolution® Plus and Profender®. The client wants to know when she can bathe the cat after application.

Which of the following is correct?

When using topical products, one should not bathe the pet for 48 hours before or after applying the product.

When using topical products, one should not bathe the pet for seven days before or after applying the product.

When using topical products, one should not bathe the pet for 72 hours before or after applying the product.

When using topical products, one should not bathe the pet for the duration of use of the product.

Correct answer: When using topical products, one should not bathe the pet for 48 hours before or after applying the product.

Revolution® Plus, in cats, is great because it helps treat/prevent heartworm disease, fleas, ticks, hookworms, roundworms, and ear mites. It is applied topically but systemically absorbed. Systemic absorption is sufficient after 48 hours. Because bathing takes away the skin's natural oils, it is best not to bathe the cat for a minimum of 48 hours before application to ensure maximum uptake and for 48 hours after for the same reason. After that time, systemic absorption has been achieved, and bathing can occur. The company even suggests that bathing after just 24 hours doesn't reduce effectiveness.

56.

A 3-pound kitten needs to be sedated with butorphanol at 0.4 mg/kg. The injectable formulation is available in 10 mg/mL concentration.

What volume should be drawn for this kitten?

0.055 mL

0.56 mL

0.4 mL

0.12 mL

Correct answer: 0.055 mL

Convert pounds to kilograms: 3 pounds / (2.2 pounds/kg) = 1.36 kg

Calculate dose from dosage: 1.4 kg x (0.4 mg/kg) = 0.55 or 0.545 is correct

Convert units from mg to mL: 0.56 mg / (10 mg/mL) = 0.055 mL

57.

The common dose of acepromazine for a horse is 0.03 to 0.05 mg/kg. A higher dose of acepromazine will increase which of the following?

Hypotension

Sedation

Restraint

Muscle relaxation

Correct answer: Hypotension

Acepromazine is a phenothiazine tranquilizer used to calm and sedate veterinary patients. Hypotension is the main adverse effect associated with acepromazine, which can also cause hypothermia, changes in heart rate, aggression, excitement, sweating, and tachypnea.

A higher dose of acepromazine will not increase sedation, restraint, or muscle relaxation, but will worsen the severity of adverse effects.

58.

You are asked to dispense a medication. You have 100-mg tablets in the hospital, but the dose needs to be 150 mg. The drug is to be administered every eight hours for 21 days. The tablets are scored, permitting halving.

How many tablets should you send home with the owner?

95 tablets

21 tablets

126 tablets

32 tablets

Correct answer: 95 tablets

The pet will need 1.5 tablets by mouth every eight hours or three times daily. Thus, 1.5 x 3 = 4.5 tablets per day x 21 days = 94.5 tablets needed.

However, most practices will not dispense half tablets, and require the owner to halve the tablets at home using a pill cutter. The label needs to emphasize that the pills will need to be cut.

59.

What is the fluid therapy rate for a dog weighing 12 kg, estimated to be 10% dehydrated, whose fluid deficit is to be delivered over 8 hours?

150 mL/hour

200 mL/hour

600 mL/hour

120 mL/hour

Correct answer: 150 mL/hour

Calculate the fluid deficit: Body weight in kg x % dehydration. 12 kg x 0.10 = 1.2 L

Calculate the fluid rate over 8 hours: 1.2 L / 8 hours = 0.15 L/hour = 150 mL/hour

60.

Diclofenac sodium is a topical nonsteroidal anti-inflammatory drug (NSAID) used in horses. The Food and Drug Administration (FDA) has approved this drug for which of the following purposes?

Joint pain and inflammation

Pain associated with equine osteoarthritis

Pain associated with colic

Spasmodic, flatulent, or impaction colic in horses

Correct answer: Joint pain and inflammation

Diclofenac sodium is an FDA-approved NSAID for joint pain and inflammation in horses. This drug may be administered every 12 hours, no more than a 5-inch ribbon of cream, for up to ten days.

Firocoxib is an FDA-approved NSAID for pain associated with equine osteoarthritis. Butorphanol is used in horses for pain associated with colic and is an opioid. Ketamine is a dissociative drug used for spasmodic, flatulent, or impaction colic in horses.

61.

A 5-kg aggressive cat receives "kitty magic" for sedation at 0.1 mL each of ketamine, dexmedetomidine, and butorphanol. The ketamine concentration is 100 mg/mL.

What is the dosage that the cat received for ketamine?

2 mg/kg

6 mg/kg

10 mg/kg

5 mg/kg

Correct answer: 2 mg/kg

Calculate the mg received of ketamine: 0.1 mL x 100 mg/mL = 10 mg

Calculate the dosage from the dose: 10 mg drug / 5 kg body weight = 2 mg/kg

62.

Acepromazine should be used with caution in patients with which of the following conditions?

Hypothermia

Hypertension

Hypothyroidism

Hyperadrenocorticism

Correct answer: Hypothermia

Acepromazine depresses the brain's thermoregulatory center. It can also produce hypotension by peripheral vasodilation. In a patient that is already hypothermic, acepromazine could complicate the patient's condition and secondary side effects further.

There are no contraindications for patients receiving acepromazine with hypertension, hypothyroidism, or hyperadrenocorticism.

63.

In pharmacology, what is an antagonist?

A drug that reverses or blocks the effect of another substance

A drug that binds to and activates a receptor

A drug used to kill cells and/or microorganisms

A drug used to alter how the kidneys balance body water

Correct answer: A drug that reverses or blocks the effect of another substance

An antagonist is a drug that counters the effect of another substance, the agonist.

An agonist is a drug that binds to and activates a receptor. A chemotherapy agent is a drug used to kill cells and/or microorganisms, often used in the treatment of cancers or immune-mediated diseases. A diuretic drug alters how the kidneys balance body water.

64.

Which of the following is **true** regarding drug disposal?

Unused drugs should never be flushed, thrown in the trash, or dumped down the drain

Pesticides and rodenticides should be disposed of after 10 years

Storage and disposal recommendations are established by the drug manufacturer

Standard expiration dates are not required to be included on drug products

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Correct answer: Unused drugs should never be flushed, thrown in the trash, or dumped down the drain

Due to both known and unknown effects that pharmacological agents can have on the environment, animals, and humans, unused drugs should never be flushed, thrown in the trash, or dumped down the drain. Expired and unused drugs should be returned to the drug manufacturer or to a reverse distribution company (RDC) that can dispose of or destroy drugs effectively.

Pesticides, including rodenticides and insecticides, are regulated by the EPA. They should be disposed of after 5 years, not 10 years.

While storage recommendations are established by the drug manufacturer and are included in package inserts, disposal is governed by the FDA, EPA, the Department of Environmental Quality, and local pharmacy boards.

The FDA requires that standard expiration dates, including the day, month, and year, are included on drug products.

65.

When used during cardiopulmonary resuscitation, what is an anticipated benefit of administering epinephrine?

Increase myocardial contractility

Peripheral vasodilation

Slowing heart rate

Decreasing metabolic needs of heart muscle

Correct answer: Increase myocardial contractility

Epinephrine is a catecholamine, or a sympathomimetic drug, meaning its actions mimic those of the sympathetic nervous system. It has both alpha- and beta-adrenergic agonist effects. During CPR, epinephrine is administered to increase myocardial contractility, or the strength of the heartbeats when contracting.

Other benefits include vasoconstriction, increasing heart rate, and increasing AV node conduction.

66.

You are asked to give a SQ Librela™ injection to a dog weighing 20.1-30 kg (44.2-66.1 lbs). The recommended dose is 0.5 mg/kg.

How many mg would you administer?

10 mg

25 mg

6 mg

9 mg

Correct answer: 10 mg

The recommended Librela dose is a minimum of 0.23 mg/lb OR 0.5 mg/kg of body weight once monthly. Thus, 0.5 mg/kg would be 10-15 mg given subcutaneously once a month.

This is an anti-nerve growth factor monoclonal antibody used to treat osteoarthritis in dogs. It has recently been approved for use in the U.S., though it has been used in other countries for much longer. It can be used as a first-line drug before NSAIDs. It is not labeled for dogs less than 12 months of age, or those lactating, pregnant, or breeding. A dosing chart is available that shows how much of a bottle/how many bottles should be used when certain weight ranges are present to limit the need for calculation. However, we want to ensure we know the correct dosing. The drug comes in various concentrations, and the size of the dog and the mg dose needed help determine which concentration is utilized.

67.

Dissociatives are injectable anesthetic agents used for brief or minor procedures. Which of the following occurs when using dissociative agents?

Intact reflexes

Indifference to light and sound

Decreased muscle tone

Decreased heart rate

Correct answer: Intact reflexes

Dissociative agents allow for the palpebral, pedal, and laryngeal reflexes to remain intact, unlike most other anesthetics. The most common dissociative agents used in veterinary medicine are ketamine and tiletamine.

The other options are incorrect because dissociative agents cause sensitivity to light and sound, increased muscle tone, and increased heart rate.

68.

Which of the following drugs is a halogenated anesthetic?

Isoflurane

Nitrous oxide

Morphine

Acepromazine

Correct answer: Isoflurane

Examples of halogenated anesthetic agents include isoflurane and sevoflurane. They are administered by inhalation with a vaporizer so they have quick induction and recovery times.

Nitrous oxide is an NMDA receptor antagonist and an inhalation anesthetic. Morphine is an opioid analgesic. Acepromazine is a phenothiazine tranquilizer.

69.

A feline patient receives U-40 insulin for diabetes mellitus at 2 IU twice daily. The owner purchases a new 10 mL vial and asks how long the vial will last.

What is the correct response?

100 days

200 days

500 days

50 days

Correct answer: 100 days

- *U-40 insulin contains 40 IU per mL. A 10 ml vial contains 40 IU/mL x 10 mL/vial = 400 IU/vial*
- *Since each dose is 2 IU, a 400 IU vial provides 400 / 2 = 200 doses*
- *The patient receives 2 doses a day, so the vial contains 200 doses / 2 doses per day = 100 days of medication*

70.

A 10-kg dog with intestinal parasites is prescribed fenbendazole at 50 mg/kg PO qd x 3d. The liquid formulation is available in 100 mg/mL.

What total volume should be dispensed for the course of therapy?

15 mL

5 mL

16.67 mL

21 mL

Correct answer: 15 mL

Calculate volume per dose: 10 kg x (50 mg/kg) / (100 mg/mL) = 5 mL

Calculate total volume dispensed: 5 mL x 3 doses = 15 mL

71.

What is Etomidate and when would it be used?

Short-acting, injectable hypnotic-sedative

Barbiturate

Ultra-short acting injectable anesthetic

Dissociative

Correct answer: Short-acting, injectable hypnotic-sedative

Etomidate is a short-acting, injectable hypnotic-sedative used for the induction phase of anesthesia in dogs and cats. The benefits include cardiovascular and respiratory sparing effects. Additionally, it can decrease increased ocular pressure and intracranial pressure. Its margin of safety is much higher than propofol and other drugs. Often, it is reserved for patients with heart or lung disease. By administering multi-modal premeditation, side effects are minimized with this drug.

Barbiturates used to be commonly used in anesthesia, pentobarbital sodium. They are most commonly used for euthanasia at this time.

Alfaxalone is a controlled, ultra-short acting injectable anesthetic comparable to propofol in effect. Side effect risks include CNS and respiratory depression and low blood pressure.

Dissociatives are commonly used in anesthesia or to provide sedation, but are commonly used in combination with tranquilizers and/or opioids for a variety of benefits and effects. These types of medications can cause normal to increased muscular tone. Additionally, they may increase heart rate and blood pressure. Lastly, they can cause sensitivity to light and sound.

72.

Anesthetic agents are classified as agonists, partial agonists, mixed agonist-antagonists, and antagonists. Which of the following **best** describes an agonist anesthetic agent?

An agent that binds to a receptor to exert an effect

An agent that blocks the effect of another agent

An agent that binds to a receptor to exert a mild effect

An agent that partially blocks the effect of another agent

Correct answer: An agent that binds to a receptor to exert an effect

An agonist is an agent that binds to a receptor to exert an effect. Most of the anesthetic agents used in veterinary medicine are agonists.

An antagonist is an agent that blocks the effect of another agent or reverses the action of that drug(agonist).

A partial agonist is an agent that binds to a receptor to exert a mild effect.

A mixed agonist-antagonist is an agent that partially blocks the effect of another agent (agonist).

73.

Which antifungal medication listed below is limited to topical use only with cats and dogs?

Miconazole

Fluconazole

Itraconazole

Ketoconazole

Correct answer: Miconazole

Miconazole is a commonly used antifungal in combination preparations for the skin and ears of cats and dogs. Under less common circumstances, it also comes in an ophthalmic formulation.

Fluconazole, itraconazole, and ketoconazole are all administered orally for systemic and dermatologic infections.

74.

Fluoroquinolones are commonly used for the treatment of what types of infections?

Gram-negative, Gram-positive, and Pseudomonas

Gram-positive and Pseudomonas

Gram-negative only

Anaerobes

Correct answer: Gram-negative, Gram-positive, and Pseudomonas

Fluoroquinolone antibiotics have a spectrum of activity including Gram-negative, Gram-positive, and Pseudomonas. They are not effective against anaerobes. Ciprofloxacin, enrofloxacin, orbifloxacin, marbofloxacin, difloxacin, and pradofloxacin are medications within the fluoroquinolone class.

Fluoroquinolones are used to treat eye, bladder, skin, lung, kidney, and ear infections. Concerns with this drug class include safety and the rapid development of antibiotic resistance. Caution is needed with young growing animals as cartilage damage has been reported in a variety of species.

75.

Which of the following pain medications is a non-steroidal anti-inflammatory drug (NSAID)?

Meloxicam

Nocita

Butorphanol

Gabapentin

Correct answer: Meloxicam

Meloxicam belongs to the non-steroidal anti-inflammatory drug class. Other drugs include carprofen, robenacoxib, grapriprant, firocoxib, phenylbutazone, flunixin meglumine, and diclofenac sodium.

Butorphanol is commonly used for sedation in combination with other drugs. It is a partial mu agonist opioid with weak pain management properties.

Nocita (active ingredient, bupivacaine) is a long-acting local anesthetic. It provides 72 hours of relief. It is injected intra-operatively and requires training before one is qualified to administer it.

Gabapentin is an anticonvulsant that is rather ineffective for seizure control as a sole agent. However, it is beneficial for neuropathic pain, wind-up (central sensitization), and chronic pain, and is found commonly as part of multimodal pain therapy in small animal medicine.

76.

A client's cat has been prescribed Clavamox (62.5 mg PO q12h x 7d). Your practice charges $2.47 per 62.5 mg tablet or $35 for a 15 mL bottle of 62.5 mg/mL liquid. The doctor has no preference on tablet vs. liquid formulation, and the owner wants the cheaper option.

How much is the client going to spend for the medication to fill the prescription at your practice?

$34.58

$35.00

$74.58

$52.50

Correct answer: $34.58

The prescription is for 62.5 mg to be given twice daily for seven days, so 14 total doses of 62.5 mg each.

Filling with tablets, this would be 14 of the 62.5 mg tablets, at $2.47 each: $2.47 x 14 tablets = $34.58

Filling with liquid, each 62.5 mg dose is 1 mL of 62.5 mg/mL concentration liquid. One 15 mL bottle would cover the seven days of medication given twice daily, so this option would cost $35.00.

77.

A 12-kg patient's orders are to receive 5 mg/kg of enrofloxacin diluted 1:1 in sterile water before giving IV. The stock vial of enrofloxacin is 22.7 mg/mL.

What is the total fluid volume to be administered IV to the patient?

5.2 mL

2.6 mL

60 mL

120 mL

Correct answer: 5.2 mL

Calculate the dose from the dosage: 12 kg x 5 mg/kg = 60 mg

Convert mg to mL: 60 mg / (22.7 mg/mL) = 2.6 mL of drug from the stock vial

To dilute in a 1:1 ratio, add 2.6 mL of sterile water to 2.6 mL of drug = 5.2 mL total

78.

A dog with methicillin-resistant Staphylococcus pyoderma has been prescribed dilute bleach sprays topically. Instructions are to make a 1:32 dilution. The owner wants to prepare this in an empty gallon jug. There are 16 cups in a gallon.

How much bleach should she put in the jug before then filling it to the top with water?

1/2 cup

1/8 cup (1 ounce)

1 cup

1/4 cup

Correct answer: 1/2 cup

Most households in the United States use ounces and gallons, but most medical calculations are performed with the metric system. It's important to be familiar with these conversions.

To make a 1:32 dilution in a container holding 16 cups, the owner would add 1/2 cup of bleach to the jug, then fill it with 15.5 cups of water to make 16 cups total.

79.

A 3% solution of hydrogen peroxide can be used as an emetic to induce vomiting in ferrets. What is the proper dosage of hydrogen peroxide when used as an emetic?

1 teaspoon per 5 pounds of body weight, not to exceed 3 tablespoons

1 tablespoon per 5 pounds of body weight, not to exceed 9 tablespoons

1 teaspoon per 10 pounds of body weight, not to exceed 5 teaspoons

1 tablespoon per 10 pounds of body weight, not to exceed 5 tablespoons

---

Correct answer: 1 teaspoon per 5 pounds of body weight, not to exceed 3 tablespoons

The proper dosage of a 3% solution of hydrogen peroxide, when used as an emetic, is 1 teaspoon per 5 pounds of body weight, not to exceed 3 tablespoons (9 teaspoons). One teaspoon is equal to 5 mL, so the maximum dose of hydrogen peroxide is 45 mL. Hydrogen peroxide can be used to induce vomiting in dogs, pigs, and ferrets. Other emetics used in veterinary medicine include apomorphine and xylazine. Do not induce emesis in rodents, rabbits, birds, horses, or ruminants.

It should be administered undiluted–not mixed into water or food. However, it is helpful to feed a small, moist meal of either canned food or a slice of bread before inducing vomiting, as it makes emesis more productive by giving the toxicant something to adhere to. Bulb syringes, feeding syringes, or turkey basters aid in administration. Hydrogen peroxide causes vomiting through mild gastric irritation. Vomiting usually occurs within minutes and can be repeated once if not initially successful at causing emesis.

Hydrogen peroxide is generally not advised in feline patients because it is not highly effective at making them vomit in a timely manner, and cats are more prone to develop gastritis or even hemorrhagic gastritis from hydrogen peroxide than dogs are. A combination of midazolam and hydromorphone may be the best choice, particularly in feline patients who are elderly or having underlying cardiovascular disease. Not only are they easier on the cardiovascular system than xylazine and dexmedetomidine, they are both reversible if needed.

80.

Neuroleptanalgesic drug combinations are generally used for their sedation and analgesia properties. Which of the following drug classes, when combined with an opioid, would **not** describe neuroleptanalgesia?

Dissociative

Phenothiazine

Benzodiazepine

Alpha-2 agonist

Correct answer: Dissociative

An example of a dissociative drug would be ketamine. These drugs work by interrupting neural transmission, affecting one's consciousness level.

Neuroleptanalgesic drugs consist of an opioid and a sedative/tranquilizer. Possible drug classes for sedatives/tranquilizers include:

- *Phenothiazines: Acepromazine*
- *Benzodiazepines: Diazepam, midazolam*
- *Alpha-2 agonists: Dexmedetomidine*

81.

Anticholinergics, such as atropine and glycopyrrolate, are primarily used to prevent or treat which of the following?

Bradycardia

Mydriasis

Bronchodilation

Cardiac tachyarrhythmias

Correct answer: Bradycardia

Anticholinergics, such as atropine and glycopyrrolate, are primarily used to prevent or treat bradycardia and excess salivation.

Mydriasis, bronchodilation, and cardiac tachyarrhythmias are potential side effects of anticholinergic administration.

82.

Which regulatory agency controls the development, testing, and approval of topical medications used in parasite prevention?

Environmental Protection Agency

Food and Drug Administration

United States Department of Agriculture

United States Pharmacopoeia

Correct answer: Environmental Protection Agency

Topical parasiticides are regulated by the United States Environmental Protection Agency (EPA). Topical parasiticides include amitraz, imidacloprid, fipronil, and permethrin. In addition to pesticides, the EPA Pesticide Regulation Division regulates insecticides and rodenticides.

The Food and Drug Administration (FDA) regulates veterinary drugs and devices, pet foods, livestock feeds, prescription and non-prescription drugs, vaccines, and blood products. The United States Department of Agriculture (USDA) oversees the area of veterinary medicine that aims to prevent, treat, or diagnose animal diseases.
The United States Pharmacopoeia (USP) compiles a list of all drugs into one place.

83.

Metronidazole is an antimicrobial drug used to treat anaerobic and some protozoal infections in all species **except** which of the following?

Cattle

Horses

Dogs

Cats

Correct answer: Cattle

It is illegal to use metronidazole to treat cattle or any other food-producing animals under FARAD (Food Animal Residue Avoidance Databank) regulations.

Metronidazole is used to treat anaerobic and protozoal infections in horses, dogs, cats, and in some exotic species.

84.

A 1500-pound horse needs a 1 mg/kg injection of flunixin available in a 50 mg/mL formulation. What volume of medication should the horse receive?

13.6 mL

34.1 mL

6.82 mL

30.0 mL

Correct answer: 13.6 mL

Convert pounds to kilograms: 1500 lbs / (2.2 lbs/kg) = 682 kg

Convert dosage to dose: 1 mg/kg x 682 kg = 682 mg

Convert mg to ml: 682 mg / (50 mg/mL) = 13.6 mL

85.

The Animal Medicinal Drug Use Clarification Act (AMDUCA) was added to the Federal Food, Drug, and Cosmetic act for what purpose?

To permit veterinarians to prescribe or use approved veterinary and human medications to treat a variety of species off-label

To provide for specific drug withdrawal times in food animals

To enable the compilation of all medications and related products and their active ingredients into a workable list

To regulate the manufacture and distribution of a variety of medical items such as devices, medications, and food additives

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Correct answer: To permit veterinarians to prescribe or use approved veterinary and human medications to treat a variety of species off-label

The Animal Medicinal Drug Use Clarification Act (AMDUCA) permits veterinarians to legally prescribe or use in a vet hospital some approved veterinary and human medications to treat a variety of species off-label, assuming specific conditions have been met. In other words, it provides for extra-label drug use.

Together, the FDA (Federal Drug Administration) and the EPA (Environmental Protection Agency) establish specific drug withdrawal times for a variety of drugs in food animals.

The U.S. Pharmacopoeia (USP) is a list of all medications and related products and their active ingredients.

The Federal Drug Administration (FDA)'s Center for Veterinary Medicine (CVM) functions as the governing entity that regulates the manufacture and distribution of a variety of medical items such as devices, medications, and food additives for veterinary species.

86.

A 5-kg cat will be discharged with a three-day supply of transmucosal buprenorphine, 20 mcg/kg q12h. The vials are 0.3 mg/mL. What is the total volume that will be dispensed to record in the controlled substance log?

2 mL

0.33 mL

0.6 mL

1 mL

Correct answer: 2 mL

Calculate one dose: 5 kg x 20 mcg/kg = 100 mcg/dose

Convert units per dose: 1 mcg = 0.001 mg; multiply each side by 100 to get: 100 mcg = 0.1 mg

Convert mg to mL per dose: 0.1 mg / (0.3 mg/mL) = 0.33 mL/dose

Calculate total number of doses: 0.33 mL/dose x (2 doses/day) x (3 days) = 2 mL

87.

Dexmedetomidine has which of the following properties?

Sedation

Anti-inflammatory

Antiemetic

Antihistamine

Correct answer: Sedation

Dexmedetomidine is an alpha$_2$ agonist used primarily for sedation. Other properties include moderate analgesia and muscle relaxation.

Dexmedetomidine does not have any anti-inflammatory, antiemetic, or antihistamine effects.

88.

A patient has the following prescription order: Cephalexin, 250 caps, 1 cap PO q8h x 14d.

How many capsules should be dispensed to fill the prescription?

42

28

14

56

Correct answer: 42

The instructions are for 1 capsule given every eight hours for 14 days.

Every 8 hours = 3 capsules per day

3 capsules per day x 14 days = 42 capsules

89.

What type of drug is used to reduce gastric acid secretions?

Proton pump inhibitor

Selective Serotonin reuptake inhibitor (SSRI)

Alpha 2 agonist

Mu agonist

Correct answer: Proton pump inhibitor

Proton pump inhibitors (PPIs) work by reducing the production of gastric acid secretions. Examples include pantoprazole and omeprazole. H2 blockers are another commonly used class of gastric antacid and include famotidine.

SSRI medications treat a variety of behavioral conditions such as separation anxiety. Examples include Fluoxetine, Paxil and others. Alpha 2 agonists are used for sedation and pain management. An example of this class is Dexmedetomidine. Mu agonists treat pain and are often combined with other medications in sedation/anesthesia protocols. Examples include Morphine and Fentanyl.

90.

A 4-year-old Portuguese water dog was hospitalized for an Addisonian crisis. The patient is now stable and heading home with medication. You are discharging the patient and going over their medications, including fludrocortisone. You discuss the medication and explain that at-home monitoring is critical.

They should be on the lookout and let the vet know as soon as possible if they notice all of the following clinical signs, except:

Polyphagia

Waxing and waning appetite

Polyuria and polydipsia

Sensitive stomach (waxing and waning GI upset)

Correct answer: Polyphagia

Addison's disease, or hypoadrenocorticism, is an uncommon condition in dogs. It is caused by atrophy of the adrenal glands, resulting in a severe electrolyte imbalance and shock. Addison's disease is considered a medical emergency and often presents in animals as weakness, vomiting, loss of appetite, and altered mentation. Patients in acute crisis have elevated potassium (K) and low sodium (NA) levels, with a very low NA to K ratio of < 23.

Fludrocortisone, a synthetic steroid, has both mineralocorticoid (aldosterone) and glucocorticoid (cortisol/prednisone) activity. The drug provides the hormones a dog's body needs to restore electrolyte imbalances to normal by signaling the kidneys to retain sodium and excrete potassium. It also provides the physiological dose of glucocorticoids needed to maintain various normal physiologic processes in the body.

It is critical to monitor for signs of reoccurrence of clinical signs. Signs of Addison's disease often mimic other diseases and include increased drinking and urination, decreased appetite, vomiting or diarrhea, lethargy, exercise intolerance, and even collapse. Signs may often wax and wane and are often brought on by stressful events such as boarding, grooming, or other alterations in normal routines. If any of these signs start to reoccur, it could mean that the dose of Fludrocortisone is insufficient or another underlying disease may be present. Regardless, owners need to be educated to monitor for these signs. If they notice a slight decrease in appetite or even a single episode of vomiting, they should alert the veterinarian as soon as possible. Addison's disease can cause life-threatening crises, and any change from normal needs to be taken seriously.

Addisonian patients often have decreased or waxing and waning appetites (not polyphagia), increased drinking and urination, and intermittent GI upset that owners often pass off as the pet having a sensitive stomach.

91.

What is a thrombolytic drug?

A drug used to dissolve blood clots

A drug used to alter how the kidneys balance body water

A drug that counters the effect of another substance

A drug that binds to and activates a receptor

Correct answer: A drug used to dissolve blood clots

Thrombolysis is the process of breaking down blood clots. This process occurs naturally with all clots but can be hastened through the use of thrombolytic drugs. These drugs have limited application in veterinary patients and costs, so they are used infrequently. Veterinary medicine lacks sound scientific evidence in support of this class' use in most cases. We primarily use them in hypercoagulable patients, such as those with immune-mediated diseases, or those with certain types of heart disease.

A diuretic drug is a drug used to alter how the kidneys balance body water. An antagonist is a drug that counters the effect of another substance (the agonist). An agonist is a drug that binds to and activates a receptor.

92.

Which of the following **best** defines the study of *pharmacodynamics*?

Effect of drugs and their mechanisms of action on the body

Drugs in crude or unprepared form

Preparation, compounding, and dispensing of drugs

Genetic variations that cause different responses to drugs in different individuals

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Correct answer: Effect of drugs and their mechanisms of action on the body

- *Pharmacodynamics: Effect of drugs and their mechanisms of action on the body*
- *Pharmacognosy: Drugs in crude or unprepared form*
- *Pharmacy: The science of preparing, compounding, and dispensing drugs; or the physical location where these compounds may be sold*
- *Pharmacogenetics: Genetic variations that cause different responses to drugs in different individuals*

93.

Diazepam is a medication often prescribed for sedation and tranquilization. How should diazepam be stored?

Room temperature

Refrigerator

Plastic syringes

Freezer

Correct answer: Room temperature

Diazepam is a benzodiazepine commonly used for tranquilization and sedation in veterinary patients. It should be stored at room temperature and protected from light exposure for best use.

Diazepam should not be stored in the refrigerator or freezer. Diazepam can bind to the plastic of syringes and IV bags, so it should be stored in plastic-free containers.

94.

A 1250 pound horse needs xylazine for sedation at 0.75 mg/kg. It is available in 100 mg/ml vials.

What volume of medication should the horse receive?

4.26 mL

5.68 mL

12.5 mL

9.4 mL

Correct answer: 4.26 mL

Convert the patient weight from pounds to kilograms: 1250 pounds / (2.2 pounds/kg) = 568 kg

Calculate the dose from the dosage: 568 kg x (0.75 mg/kg) = 426 mg

Convert mg to mL: 426 mg / (100 mg/mL) = 4.26 mL

95.

Opioid agonists affect various species differently. Large animals tend to experience which of the following when an opioid agonist is administered?

Anxiety

Sedation

Hypothermia

Miosis

Correct answer: Anxiety

Large animals tend to experience anxiety when an opioid agonist is administered due to their mu-receptor activity. In addition to excitement, large animals and cats may develop hyperthermia and mydriasis when administered an opioid agonist.

Opioids cause sedation, hypothermia, and miosis for dogs and primates, not large animals.

96.

A cat has a 250 mL bag of LRS. LRS starts with 4 mEq KCl/L, and the patient needs to receive a total of 20 mEq/L of KCl. The stock solution of KCl to use as a fluid additive is 2 mEq/mL.

What volume of the stock solution should be added to the IV fluid bag?

2 mL

4 mL

16 mL

8 mL

Correct answer: 2 mL

Start with a per liter amount of KCl to add. The starting LRS has 4 Eq/L and the final amount needed for administration is 20 mEq/L. You need to add 16 mEq/L.

This patient's bag is 250 mL, or 1/4 of a liter. You need to add 1/4 of the KCl needed for a liter bag to bring the 250 mL bag up to the appropriate concentration: 16 mEq per liter = 4 mEq per 250 mL

Convert mEq to mL: 4 mEq / (2 mEq/ml) = 2 mL

97.

Which of the following is a reversible alpha-2 agonist?

Dexmedetomidine

Propofol

Sevoflurane

Isoflurane

Correct answer: Dexmedetomidine

Dexmedetomidine (Dexdomitor) is a predictable and reversible anesthetic agent that falls into the category of alpha-2 agonists. It is primarily used in small and exotic animals. Anesthesia may be quickly reversed using atipamezole, resulting in rapid patient recovery. This protocol is often used in minor outpatient procedures.

Propofol is a hypnotic/amnestic agent, not an alpha-2 agonist.

Sevoflurane and isoflurane are inhalants.