NIPER JEE 2026

Question Paper With Solutions PDF

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General Instructions

(i) The examination consists of 200 multiple-choice questions (MCQs).

(ii) Duration of the examination is 2 hours (120 minutes).

(iii) Each correct answer carries +1 mark.

(iv) Each wrong answer carries a penalty of -0.25 marks (negative marking).

(v) Unanswered questions will receive 0 marks.

1. Type B gelatin is from an alkali treated precursor and has its isoelectric zone in the region of:

(A) pH 9.0
(B) pH 4.7
(C) pH 7.0
(D) pH 1.2

Correct Answer: (B) pH 4.7

Solution:

Step 1: Understanding the Concept:
Gelatin is derived from collagen. There are two main types: Type A (acid-processed) and Type B (alkali-processed). The processing method significantly alters the isoelectric point (pI) of the resulting protein by converting asparagine and glutamine residues into aspartic and

glutamic acids.

Step 2: Detailed Explanation:

- **Type A Gelatin:** Produced via acid hydrolysis of collagen (usually from pork skin). It typically has an isoelectric point between pH 7.0 and 9.0.
- **Type B Gelatin:** Produced via alkaline hydrolysis of collagen (usually from bovine hides). During alkaline processing, the amide groups of asparagine and glutamine are hydrolyzed to carboxylic acids. This increases the number of free carboxyl groups, shifting the isoelectric point to a more acidic range, typically between pH 4.7 and 5.2.

Step 3: Final Answer:
The isoelectric zone for Type B gelatin is in the region of pH 4.7.

Quick Tip: Remember the 'A-Acid-High' mnemonic: Type A is Acid-processed and has a Higher isoelectric point (pH 7-9). Type B is Base(alkali)-processed and has a Lower isoelectric point (pH 4.7-5.2).

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2. The HLB value of sodium oleate is:

(A) Approx 3.0
(B) Around 10.0
(C) Around 18.0
(D) Approx 40.0

Correct Answer: (C) Around 18.0

Solution:

Step 1: Understanding the Concept:
The Hydrophile-Lipophile Balance (HLB) scale is used to categorize surfactants. A higher HLB value indicates a more hydrophilic (water-loving) surfactant, while a lower value indicates a more lipophilic (oil-loving) surfactant.

Step 2: Detailed Explanation:

Sodium oleate is a salt of a long-chain fatty acid. Because it has a highly polar, charged head group (the carboxylate anion) attached to a long hydrocarbon chain, it is a very effective solubilizing agent for oil-in-water emulsions. According to the Griffin HLB scale:

- Low HLB (3–6): Good for water-in-oil (W/O) emulsions.
- Moderate HLB (7–9): Good wetting agents.
- High HLB (10–18+): Good for oil-in-water (O/W) emulsions and solubilization.

Sodium oleate typically falls in the range of 18, classifying it as a strong hydrophilic surfactant.

Step 3: Final Answer:

The HLB value of sodium oleate is around 18.0.

Quick Tip: Remember the general rule: Ionic surfactants like sodium oleate generally have much higher HLB values compared to non-ionic surfactants because the fully ionized group is strongly hydrophilic.

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3. By coating the granules with water-insoluble polymer, one can achieve the release of drug as per:

(A) Zero order rate
(B) First order rate
(C) Half order rate
(D) Pseudo First order rate

Correct Answer: (A) Zero order rate

Solution:

Step 1: Understanding the Concept:

Controlled-release formulations aim to maintain a constant concentration of the drug

in the blood over time. This is best achieved through zero-order release kinetics, where the rate of release is independent of the remaining concentration of the drug in the dosage form.

Step 2: Detailed Explanation:
When granules are coated with a water-insoluble but permeable polymer (like ethylcellulose or polymethacrylates), the drug release is governed by the diffusion of the drug through the polymer membrane. If the coating creates a constant surface area and the diffusion distance remains constant, the release rate stays constant (zero-order) as long as there is an excess of the drug inside the granule (maintaining a constant saturation gradient).

Step 3: Final Answer:
Coating granules with water-insoluble polymers is a common strategy to approach zero-order release kinetics.

Quick Tip: Zero-order release is the "Gold Standard" for controlled-release systems because it provides a steady plasma concentration, avoiding the peaks and troughs seen in first-order release.

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4. In transdermal therapeutic systems the most commonly used penetration enhancer is

(A) Glycerin
(B) Propyl Glycol
(C) Dimethyl sulfoxide
(D) Lanolin

Correct Answer: (C) Dimethyl sulfoxide

Solution:

Step 1: Understanding the Concept:
Penetration enhancers are substances that increase the permeability of the skin to allow for the absorption of drug molecules.

Step 2: Detailed Explanation:

Dimethyl sulfoxide (DMSO) is a potent solvent and one of the most widely studied chemical penetration enhancers.

It works by disrupting the lipid structure of the stratum corneum, thereby lowering the barrier function and facilitating drug transport.

While others like propylene glycol can act as solvents, DMSO is classically recognized in pharmacological texts for its significant enhancement properties.

Step 3: Final Answer:

Dimethyl sulfoxide is considered a commonly used and highly effective penetration enhancer.

Quick Tip: Penetration enhancers work by modifying skin lipids, denaturing proteins, or improving drug solubility.

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5. Transdermal preparations are prepared for those drugs which

(A) Undergoes first pass metabolism

(B) have bigger molecules

(C) are costly

(D) are hydrophilic

Correct Answer: (A) Undergoes first pass metabolism

Solution:

Step 1: Understanding the Concept:

The main purpose of the transdermal route is to deliver drugs systemically while bypassing the gastrointestinal tract and liver.

Step 2: Detailed Explanation:

Oral drugs often suffer from extensive hepatic first-pass metabolism, which reduces their

bioavailability.
By applying the drug through the skin, it enters the systemic circulation directly via capillaries, avoiding the initial pass through the liver.
For a drug to be suitable for transdermal delivery, it should be lipophilic, have a low molecular weight, and be potent to compensate for the limited surface area of application.

Step 3: Final Answer:
Transdermal delivery is preferred for drugs that undergo significant first-pass metabolism to improve overall bioavailability.

Quick Tip: Transdermal candidates usually follow the "Rule of 5" for absorption: small molecule, lipophilic, and potent.

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6. A sustained release products can be prepared by using

(A) Solid dispersion technique with water soluble excipients
(B) Large particles delaying its disintegration
(C) Spray drying technique with water soluble excipients
(D) A good disintegrating agent

Correct Answer: (B) Large particles delaying its disintegration

Solution:

Step 1: Understanding the Concept:
Sustained release is achieved by slowing down the rate of drug release so that it lasts for an extended period.

Step 2: Detailed Explanation:
Disintegration and dissolution are the rate-limiting steps for drug absorption.
By using large particles (or granules), the total surface area exposed to the dissolution

medium is minimized.
This results in a slower rate of dissolution, thereby sustaining the release of the drug over a longer period compared to fine powders.

Step 3: Final Answer:
Using large particles to delay disintegration is a classic physical method to achieve sustained release.

Quick Tip: Sustained release strategies include: osmotic pumps, matrix systems, and reservoir coating.

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7. The Implant of sustained release devices which are:

(A) Introduced into tissues
(B) taken orally
(C) Used in place of suppository
(D) Placed on the skin to release the drug

Correct Answer: (A) Introduced into tissues

Solution:

Step 1: Understanding the Concept:
Sustained release implants are specialized parenteral drug delivery systems designed to provide a continuous, prolonged release of a therapeutic agent directly into the body over an extended period, ranging from weeks to years.

Step 2: Detailed Explanation:
Implants (or inserts) are sterile, solid, or semi-solid dosage forms that are surgically implanted or injected into subcutaneous or intramuscular tissues. Unlike oral tablets (Option B) or transdermal patches (Option D), which rely on absorption through the GI tract or skin barrier, implants are placed directly into the tissue environment. This allows them to bypass the

"first-pass metabolism" and provide highly consistent, localized or systemic therapeutic levels.

Step 3: Final Answer:

Sustained release implants are defined by their introduction into body tissues.

Quick Tip: Implants are the most invasive form of sustained-release technology, but they offer the highest level of control over the drug's delivery rate compared to oral or transdermal methods.

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8. The release of drug from cellulose acetate phthalate is due to:

(A) pH independent solubility
(B) pH dependent solubility
(C) Release of drug due to erosion
(D) Zero order release

Correct Answer: (B) pH dependent solubility

Solution:

Step 1: Understanding the Concept:

Cellulose acetate phthalate (CAP) is a common enteric coating material. Enteric coatings are designed to remain intact in the highly acidic environment of the stomach and dissolve only upon reaching the higher pH environment of the small intestine.

Step 2: Detailed Explanation:

CAP contains free carboxylic acid groups (-COOH) from the phthalate portion of the molecule.

- **In the Stomach (pH 1–3):** The acidic environment keeps the carboxylic acid groups protonated (-COOH). In this state, CAP is insoluble, protecting the drug from stomach acid.
- **In the Intestine (pH $>$ 5.5):** The basic environment causes the ionization of the carboxylic acid groups to carboxylate ions ($-COO^-$). This ionization makes the polymer

highly soluble, causing it to dissolve rapidly and release the entrapped drug.

Step 3: Final Answer:

The release of the drug is governed by the pH-dependent solubility of the polymer.

Quick Tip: "Enteric" means intestinal. Any polymer that is an enteric coating, like CAP, must be pH-sensitive to ensure it does not dissolve in the stomach but does dissolve in the intestine.

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9. Methyl cellulose dissolves better in:

(A) Cold water
(B) Hot water
(C) Soft paraffin
(D) Glycerin

Correct Answer: (A) Cold water

Solution:

Step 1: Understanding the Concept:

Methyl cellulose is a cellulose ether that exhibits a unique property known as thermal gelation or inverse solubility. It is more soluble in cold water than in hot water.

Step 2: Detailed Explanation:

In cold water, the methyl cellulose molecules form hydrogen bonds with water molecules, leading to hydration and dissolution. However, as the temperature increases, these hydrogen bonds break, and the hydrophobic methyl groups interact with each other, causing the polymer to precipitate or form a gel. This is why methyl cellulose solutions often thicken or solidify when heated (thermal gelation) and become clear/dissolved when cooled.

Step 3: Final Answer:

Methyl cellulose dissolves most effectively in cold water.

Quick Tip: Always remember: Methyl cellulose is "thermally gelling." Heating it makes it turn into a gel (precipitate), while cooling it makes it dissolve into a liquid solution.

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10. In pharmaceutical dosage forms for external application, the glycerin is used as

(A) Therapeutic agent

(B) Humectant

(C) Surface active agent

(D) antiseptic

Correct Answer: (B) Humectant

Solution:

Step 1: Understanding the Concept:
Topical formulations need ingredients to maintain moisture and prevent the formulation from drying out.

Step 2: Detailed Explanation:
Glycerin (or glycerol) is a polyol that is hygroscopic, meaning it attracts and holds water. In external applications like creams and lotions, it acts as a humectant by keeping the skin hydrated and preventing the product from hardening due to evaporation.

Step 3: Final Answer:
Glycerin is primarily used as a humectant in topical products.

Quick Tip: Humectants are crucial in lotions to provide a cooling effect and maintain skin suppleness.

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11. Aerosil is a pharmaceutical excipient and it is also called

(A) Spray drying lactose

(B) Calcium sulphate

(C) Colloidal silica

(D) HPMC

Correct Answer: (C) Colloidal silica

Solution:

Step 1: Understanding the Concept:

Aerosil is a brand name for a common pharmaceutical additive used to improve powder flow.

Step 2: Detailed Explanation:

Aerosil is chemically known as colloidal silicon dioxide or colloidal silica.

It is used in very small concentrations as a glidant to improve the flowability of granular materials during tableting and to prevent powder bridging.

Step 3: Final Answer:

Aerosil is commonly referred to as colloidal silica.

Quick Tip: Aerosil is highly effective as a glidant even at very low concentrations (0.1-0.5

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12. India was officially struck off the list of polio-endemic countries by the World Health Organization (WHO)

(A) 25 December, 2012

(B) 15 February, 2012

(C) 25 January, 2012

(D) 25 February, 2012

Correct Answer: (D) 25 February, 2012

Solution: **Step 1: Understanding the Concept:**

This is a factual question regarding global public health milestones in India.

Step 2: Detailed Explanation:

After a sustained effort and mass vaccination campaigns, India achieved a significant milestone by remaining polio-free for a year.

The WHO officially removed India from the list of polio-endemic countries on February 25, 2012.

Step 3: Final Answer:

The correct date for India being struck off the polio-endemic list by the WHO is 25 February, 2012.

Quick Tip: Public health awareness questions require memorizing dates of major health milestones.

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13. After the birth which of the following vaccine given primarily to the infant:

(A) BCG

(B) OPV zero

(C) Hepatitis B - 1

(D) All

Correct Answer: (D) All

Solution:

Step 1: Understanding the Concept:

The birth dose vaccination schedule is critical for providing early immunity against life-threatening infectious diseases. These vaccines are administered as soon as possible after birth, typically within the first 24 hours.

Step 2: Detailed Explanation:

According to standard national immunization schedules (such as India's Universal Immunization Programme):

- **BCG (Bacillus Calmette-Guérin):** Administered at birth or as early as possible till one year of age to protect against tuberculosis.
- **OPV Zero (Oral Polio Vaccine):** Administered at birth to protect against poliomyelitis.
- **Hepatitis B birth dose:** Administered within 24 hours of birth to prevent vertical transmission of the Hepatitis B virus from mother to child.

Step 3: Final Answer:
Since all three vaccines (BCG, OPV zero, and Hepatitis B-1) are recommended as birth doses, the correct option is (D).

Quick Tip: Remember the "Birth Trio": BCG (TB), OPV-0 (Polio), and Hep-B (Hepatitis B). These are the pillars of immediate post-natal immunization.

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14. Drug protein binding can be determined by:

(A) Chromatography
(B) Dialysis
(C) Phase separation
(D) Langmuir's method

Correct Answer: (B) Dialysis

Solution:

Step 1: Understanding the Concept:
Drug-protein binding is a critical pharmacokinetic parameter. It determines the concentration of "free" (pharmacologically active) drug in the plasma versus the amount "bound" to plasma proteins like albumin.

Step 2: Detailed Explanation:

The most widely used and standard laboratory method for determining drug-protein binding is **Equilibrium Dialysis**.

- **Mechanism:** A dialysis membrane (which allows small drug molecules to pass but blocks large protein-drug complexes) separates two compartments: one containing the protein-drug mixture and the other containing a buffer.
- **Equilibrium:** Over time, the free drug reaches an equilibrium across the membrane. By measuring the concentration of the drug in the buffer side, researchers can calculate the degree of protein binding.

Step 3: Final Answer:

Dialysis (specifically Equilibrium Dialysis) is the standard method used for this determination.

Quick Tip: While other methods like ultrafiltration and equilibrium dialysis are common, equilibrium dialysis is considered the "gold standard" because it involves minimal disruption of the binding equilibrium.

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15. Shock organ in anaphylaxis is:

(A) Liver
(B) Lung
(C) Kidney
(D) Spleen

Correct Answer: (B) Lung

Solution:

Step 1: Understanding the Concept:

In immunology, the "shock organ" refers to the primary site where an allergic reaction manifests with the most severe physiological impact. Anaphylaxis is a systemic, life-threatening type I

hypersensitivity reaction.

Step 2: Detailed Explanation:

When an allergen triggers the release of mediators (like histamine and leukotrienes) from mast cells and basophils, these mediators act on specific target organs.

- In humans, the **lungs** are the primary shock organ. The mediators cause intense bronchoconstriction, airway edema, and respiratory distress, which is often the most life-threatening aspect of anaphylaxis.
- Other systems involved include the cardiovascular system (leading to shock) and the skin (hives). However, the respiratory manifestation in the lungs defines the primary shock organ in human anaphylactic reactions.

Step 3: Final Answer:

The shock organ in human anaphylaxis is the lung.

Quick Tip: Always distinguish between "shock organ" and "target organ." The lung is the human shock organ, whereas in guinea pigs, the lungs are also the primary shock organ, but in other animals like dogs, the liver is the shock organ.
