

GPAT 2026 Question Paper with Solutions (Memory Based)

Time Allowed :3 Hours	Maximum Marks :100	Total Questions :100
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General Instructions

1. The GPAT 2026 exam will be conducted in online mode (Computer-Based Test).
2. The total duration of the exam is 3 hours.
3. The exam consists of 125 multiple-choice questions (MCQs).
4. Each correct answer carries 4 marks, and 1 mark will be deducted for each incorrect answer.
5. Questions in the exam are divided into various sections such as Pharmaceutical Chemistry, Pharmacology, Pharmaceutics, Pharmacognosy, Medicinal Chemistry, Biochemistry, Microbiology, and Clinical Pharmacy.
6. Candidates must carry the GPAT 2026 admit card and a valid photo ID proof to the exam center.
7. Mobile phones, calculators, and any other electronic devices are strictly prohibited in the exam hall.
8. All questions in the exam are compulsory. Choose the most appropriate answer for each question.
9. Ensure to follow the on-screen instructions during the exam carefully.

1. Which of the following phenothiazine neuroleptic is a piperidine derivative?

- (A) Thioridazine
- (B) Trifluoperazine
- (C) Perphenazine
- (D) Promazine

Correct Answer: (A) Thioridazine

Solution:

Step 1: Understanding the Concept:

Phenothiazines are a major class of typical antipsychotics.

They are chemically classified based on the nature of the substituent (side chain) at the 10th position of the phenothiazine ring.

Step 2: Key Formula or Approach:

The approach is to classify the drug based on its heterocyclic side chain:

1. Aliphatic side chain (e.g., Promazine, Chlorpromazine).
2. Piperidine side chain (e.g., Thioridazine, Mesoridazine).

3. Piperazine side chain (e.g., Trifluoperazine, Perphenazine, Fluphenazine).

Step 3: Detailed Explanation:

- **Thioridazine** contains a piperidine ring in its side chain. It is known for its lower propensity for extrapyramidal side effects but high risk of pigmentary retinopathy at high doses.
- **Trifluoperazine** and **Perphenazine** belong to the piperazine group, which are highly potent.
- **Promazine** belongs to the aliphatic group.

Step 4: Final Answer:

Therefore, Thioridazine is the correct piperidine derivative.

 Quick Tip

Remember: "Piper-I-dine" drugs often have an "i" before the "azine" like Thioridazine. "Piper-A-zine" drugs often have an "e" or "u" like Trifluoperazine.

2. Neuroleptics mediated parkinsonism is alleviated by

- (A) Antimuscarinics
- (B) Amantadine
- (C) Levodopa
- (D) Selegiline

Correct Answer: (A) Antimuscarinics

Solution:

Step 1: Understanding the Concept:

Neuroleptics (antipsychotics) work by blocking dopamine D_2 receptors.

In the basal ganglia, there is a functional balance between inhibitory Dopamine and excitatory Acetylcholine (ACh).

Step 2: Key Formula or Approach:

Approach: To treat drug-induced parkinsonism, we must restore the Dopamine-ACh balance. Since we cannot use Levodopa (it would worsen psychosis), we must reduce the relative excess of ACh.

Step 3: Detailed Explanation:

When neuroleptics block D_2 receptors in the striatum, the inhibitory control over cholinergic neurons is lost.

This leads to cholinergic overactivity, resulting in parkinsonian symptoms (tremors, rigidity). Centrally acting antimuscarinic drugs (like Trihexyphenidyl or Benztropine) block these ACh receptors and alleviate the symptoms.

Step 4: Final Answer:

Antimuscarinics are the standard treatment for alleviating neuroleptic-induced parkinsonism.

💡 Quick Tip

Never use Levodopa to treat antipsychotic-induced extrapyramidal symptoms because it can stimulate the mesolimbic pathway and cause a relapse of psychosis.

3. Which of the following drugs is both α and β blocker?

- (A) Phentolamine
- (B) Phenoxybenzamine
- (C) Labetalol
- (D) Indoramin

Correct Answer: (C) Labetalol

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

Adrenergic blockers usually target specific receptors.
Standard beta-blockers end in "-olol".

Step 2: Key Formula or Approach:

Approach: Identify "hybrid" or "third-generation" beta-blockers that possess additional alpha-blocking activity.

Step 3: Detailed Explanation:

- **Labetalol** is a competitive antagonist at both α_1 and β (β_1 and β_2) receptors.
- It is particularly useful in treating hypertensive emergencies and hypertension in pregnancy.
- **Phentolamine** and **Phenoxybenzamine** are pure alpha-blockers.
- **Indoramin** is a selective α_1 blocker.

Step 4: Final Answer:

Labetalol is the drug among the choices that blocks both alpha and beta receptors.

💡 Quick Tip

The two most common mixed blockers asked in exams are Labetalol and Carvedilol.
Remember them as "Alpha + Beta" hybrids.

4. Digitalis toxicity is aggravated by

- (A) Hypokalemia
- (B) Hyponatremia
- (C) Hypocalcemia
- (D) Hypomagnesemia

Correct Answer: (A) Hypokalemia

Solution:

Step 1: Understanding the Concept:

Digitalis (Digoxin) inhibits the Na^+-K^+ ATPase pump on myocardial cell membranes.

Step 2: Key Formula or Approach:

Approach: Analyze the competitive binding between Digoxin and Potassium (K^+) at the ATPase pump site.

Step 3: Detailed Explanation:

Digoxin competes with extracellular potassium ions for the same binding site on the Na^+-K^+ ATPase enzyme.

When potassium levels are low (**Hypokalemia**), there are fewer K^+ ions to compete with Digoxin.

This results in increased binding of Digoxin to the pump, leading to excessive inhibition and toxicity.

Conversely, Hypercalcemia and Hypomagnesemia also increase toxicity risk, but Hypokalemia is the most frequent clinical cause.

Step 4: Final Answer:

Hypokalemia significantly aggravates Digitalis toxicity due to reduced competition at the receptor site.

Quick Tip

A mnemonic for factors increasing Digoxin toxicity: "Low K, Low Mg, High Ca" ($\downarrow K^+, \downarrow Mg^{2+}, \uparrow Ca^{2+}$).

5. Preferred antihypertensive drug during pregnancy is

- (A) Propranolol
- (B) Hydralazine
- (C) Hydrochlorothiazide
- (D) Sodium nitroprusside

Correct Answer: (B) Hydralazine

Solution:

Step 1: Understanding the Concept:

Managing hypertension in pregnancy requires drugs that do not cause fetal harm (teratogenicity) or compromise placental blood flow.

Step 2: Key Formula or Approach:

Approach: Identify drugs traditionally considered safe and effective for maternal and fetal health during gestation.

Step 3: Detailed Explanation:

- **Hydralazine** is a direct-acting vasodilator often used for the acute management of severe hypertension in pregnancy (Preeclampsia/Eclampsia).
- Other safe drugs include Methyldopa (first-line for chronic HTN) and Labetalol.
- **Sodium nitroprusside** is avoided due to potential cyanide toxicity in the fetus.
- **ACE inhibitors** and **ARBs** are strictly contraindicated due to fetal renal damage.

Step 4: Final Answer:

Hydralazine is a preferred agent for controlling high blood pressure during pregnancy.

💡 Quick Tip

Standard safe drugs in pregnancy: **M**ethyldopa, **H**ydralazine, **L**abetalol, **N**ifedipine (Mnemonic: **M**arried **H**ousewives **L**ove **N**ifedipine).

6. All of the following are first line antitubercular drugs except

- (A) Isoniazid
- (B) Rifampicin
- (C) Kanamycin
- (D) Ethambutol

Correct Answer: (C) Kanamycin

Solution:

Step 1: Understanding the Concept:

Antitubercular drugs are divided into two main categories: First-line (high efficacy, low toxicity) and Second-line (lower efficacy or higher toxicity, used for resistant cases).

Step 2: Key Formula or Approach:

Approach: List the standard first-line regimen (HRZES).

Step 3: Detailed Explanation:

The primary first-line drugs for Tuberculosis are:

1. Isoniazid (H)
2. Rifampicin (R)
3. Pyrazinamide (Z)
4. Ethambutol (E)
5. Streptomycin (S)

Kanamycin is an injectable aminoglycoside categorized as a second-line drug, used primarily in Multi-Drug Resistant Tuberculosis (MDR-TB).

Step 4: Final Answer:

Kanamycin is not a first-line drug.

 Quick Tip

Remember the mnemonic "PRISE" for first-line drugs: **P**yrazinamide, **R**ifampicin, **I**soniazid, **S**treptomycin, **E**thambutol.

7. Combination of drug which is effective in the treatment of angina pectoris is

- (A) Atenolol, Isoproterenol, diltiazem
- (B) Isosorbide, nifedipine, propranolol
- (C) Nitroglycerin, Isosorbide, atenolol
- (D) None of the above

Correct Answer: (B) Isosorbide, nifedipine, propranolol

Solution:

Step 1: Understanding the Concept:

Angina therapy requires reducing the myocardial oxygen demand or increasing oxygen supply.

Step 2: Key Formula or Approach:

Approach: Combine different classes of drugs (Nitrates, Beta-blockers, CCBs) to achieve synergy and minimize compensatory reflexes.

Step 3: Detailed Explanation:

- **Isosorbide** (Nitrate) reduces preload via venodilation.
- **Nifedipine** (Calcium Channel Blocker) reduces afterload via arterial dilation.
- **Propranolol** (Beta-blocker) reduces heart rate and contractility.

Combining these three addresses different aspects of cardiac workload.

Option A is wrong because Isoproterenol (beta-agonist) increases heart rate and oxygen demand, which is harmful in angina.

Option C is redundant because it uses two nitrates (Nitroglycerin and Isosorbide).

Step 4: Final Answer:

The combination of a Nitrate, a CCB, and a Beta-blocker (Option B) is highly effective.

💡 Quick Tip

Beta-blockers are excellent when combined with Nitrates because they block the reflex tachycardia caused by Nitrates.

8. Isoxsuprine is used to treat

- (A) Asthma
- (B) Severe Hypotension
- (C) Nasal congestion
- (D) Premature labor

Correct Answer: (D) Premature labor

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

Isoxsuprine is a β_2 -adrenergic agonist.

Step 2: Key Formula or Approach:

Approach: Identify the physiological effect of β_2 stimulation on smooth muscle.

Step 3: Detailed Explanation:

Stimulation of β_2 receptors leads to the relaxation of smooth muscles.

In the uterus, β_2 agonists (tocolytics) relax the myometrium.

Isoxsuprine is clinically utilized to suppress uterine contractions and delay **premature labor**.

It has also been used as a peripheral vasodilator.

Step 4: Final Answer:

The primary use of Isoxsuprine among the options is the management of premature labor.

💡 Quick Tip

Drugs used to stop labor are called **Tocolytics**. Common examples include Isoxsuprine, Ritodrine, Terbutaline, and Nifedipine.

9. A young woman complains of severe abdominal pain at the time of menstruation. Careful evaluation indicates the presence of significant endometrial deposits

on the pelvic peritoneum. The most rational therapy for this patient would be

- (A) Flutamide
- (B) Danazol
- (C) Mestranol
- (D) Estradiol

Correct Answer: (B) Danazol

Solution:

Step 1: Understanding the Concept:

The condition described (endometrial tissue outside the uterus) is **endometriosis**. It is an estrogen-dependent condition.

Step 2: Key Formula or Approach:

Approach: Treat by suppressing the hypothalamic-pituitary-ovarian axis to induce a state of "pseudomenopause," which starves the ectopic tissue.

Step 3: Detailed Explanation:

- **Danazol** is a synthetic steroid that inhibits gonadotropin secretion (LH/FSH).
- It creates a low-estrogen, high-androgen environment which causes the endometrial deposits to atrophy.
- **Estradiol** and **Mestranol** are estrogens, which would worsen the disease.
- **Flutamide** is an anti-androgen used for prostate cancer.

Step 4: Final Answer:

Danazol is the most rational choice for treating endometriosis.

💡 Quick Tip

For endometriosis, think "suppression." We need to lower estrogen levels. Danazol and GnRH agonists (like Leuprolide) are key players.

10. The primary standard used to standardize acetic perchloric acid is

- (A) Benzoic acid
- (B) Potassium hydrogen phthalate
- (C) Oxalic acid
- (D) Sodium carbonate

Correct Answer: (B) Potassium hydrogen phthalate

Solution:

Step 1: Understanding the Concept:

Standardization is required for titrants used in non-aqueous titrations. Perchloric acid in glacial acetic acid is used for titrating weak bases.

Step 2: Key Formula or Approach:

Approach: Identify the specific primary standard that behaves as a base in glacial acetic acid media.

Step 3: Detailed Explanation:

- Perchloric acid ($HClO_4$) is the strongest acid in acetic acid.
- **Potassium Hydrogen Phthalate (KHP)** is a versatile primary standard.
- In an acidic solvent like glacial acetic acid, KHP acts as a base and reacts quantitatively with perchloric acid.
- The endpoint is typically observed using Crystal Violet indicator.

Step 4: Final Answer:

Potassium hydrogen phthalate is used for the standardization of acetic perchloric acid.

💡 Quick Tip

Non-aqueous titration is used when the drug is a very weak base (like caffeine) that cannot be titrated in water. Perchloric acid is the "super acid" used here.

11. Which of the following is used to demask zinc from the zinc-cyanide complex?

- (A) Tiron
- (B) Potassium iodide
- (C) Chloral hydrate
- (D) Triethanolamine

Correct Answer: (C) Chloral hydrate

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

Masking prevents a metal ion from reacting with EDTA. Demasking releases the metal ion back into solution so it can be measured.

Step 2: Key Formula or Approach:

Approach: Identify a reagent that selectively reacts with the cyanide ion in the $[Zn(CN)_4]^{2-}$ complex.

Step 3: Detailed Explanation:

- Cyanide is used to mask ions like Zn, Cd, Cu .

- To titrate Zinc specifically, we add **Chloral hydrate** (or formaldehyde).
- These aldehydes react with the cyanide ligands to form cyanohydrins.
- This reaction breaks the zinc-cyanide bond, releasing free Zn^{2+} to react with EDTA.

Step 4: Final Answer:

Chloral hydrate acts as a demasking agent for Zinc.

💡 Quick Tip

Think of "Cyanohydrin formation." Only aldehydes (Formaldehyde/Chloral hydrate) can pull cyanide away from Zinc in this specific analytical technique.

12. The IR detector which consists of a small metal cylinder closed by a blackened metal plate on one end and a flexible metalized diaphragm on the other is

- (A) Bolometer
- (B) Thermistor
- (C) Golay cell
- (D) Pyroelectric detectors

Correct Answer: (C) Golay cell

Solution:

Step 1: Understanding the Concept:

Infrared detectors are sensitive to the thermal energy of IR radiation.

Step 2: Key Formula or Approach:

Approach: Differentiate between resistance-based (Bolometer), voltage-based (Pyroelectric), and pressure-based (Pneumatic) detectors.

Step 3: Detailed Explanation:

- The **Golay cell** is a pneumatic detector.
- It uses a gas-filled chamber. One side absorbs IR (blackened plate), causing the gas to heat and expand.
- This expansion pushes against a flexible diaphragm.
- The movement of the diaphragm is monitored by a light beam reflected off its surface.

Step 4: Final Answer:

The description exactly matches the construction of a Golay cell.

 Quick Tip

Golay cell = Pneumatic (Gas) detector. Most common IR detector in modern FTIR is the DTGS (Pyroelectric) detector.

13. The Henderson's equation states that

- (A) $\text{pH} = \text{pK}_a + \log \frac{[\text{salt}]}{[\text{acid}]}$
(B) $\text{pH} = \text{pK}_a - \log \frac{[\text{salt}]}{[\text{acid}]}$
(C) $\text{pH} = \text{pK}_a - \log \frac{[\text{acid}]}{[\text{salt}]}$
(D) $\text{pH} = \text{pK}_a + \log \frac{[\text{acid}]}{[\text{salt}]}$

Correct Answer: (A) $\text{pH} = \text{pK}_a + \log \frac{[\text{salt}]}{[\text{acid}]}$

Solution:

Step 1: Understanding the Concept:

The Henderson-Hasselbalch equation is used to calculate the pH of a buffer solution.

Step 2: Key Formula or Approach:

The approach involves the dissociation constant K_a of a weak acid $HA \rightleftharpoons H^+ + A^-$.

Formula: $K_a = \frac{[H^+][A^-]}{[HA]}$

Step 3: Detailed Explanation:

Rearranging the dissociation formula:

$$[H^+] = K_a \cdot \frac{[HA]}{[A^-]}$$

Taking the negative logarithm ($-\log$) on both sides:

$$-\log[H^+] = -\log K_a - \log \left(\frac{[HA]}{[A^-]} \right)$$

$$\text{pH} = \text{pK}_a + \log \left(\frac{[A^-]}{[HA]} \right)$$

Since $[A^-]$ is the salt (conjugate base) and $[HA]$ is the weak acid:

$$\text{pH} = \text{pK}_a + \log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$$

Step 4: Final Answer:

Equation (A) correctly represents the Henderson-Hasselbalch relationship.

💡 Quick Tip

Remember: "S" before "A" in the log term. $pH = pK_a + \log(\text{Salt}/\text{Acid})$.

14. The standard redox potential of MnO_4^- / Mn^{+2} systems is

- (A) +1.52 V
- (B) -0.51 V
- (C) +0.77 V
- (D) -0.06 V

Correct Answer: (A) +1.52 V

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

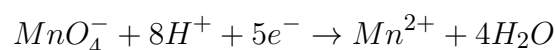
Standard reduction potential (E°) indicates the tendency of a species to be reduced.

Step 2: Key Formula or Approach:

Approach: Reference the standard electrochemical series for the permanganate reduction half-reaction in acidic medium.

Step 3: Detailed Explanation:

The reduction of Permanganate in acidic solution is:



This reaction has a very high positive potential, approximately **+1.51 to +1.52 V**. High positive values mean the substance (MnO_4^-) is a very strong oxidizing agent.

Step 4: Final Answer:

The standard redox potential for this system is +1.52 V.

💡 Quick Tip

The more positive the E° , the stronger the oxidizing agent. Potassium Permanganate is one of the strongest commonly used oxidizing agents in the lab.

15. Which of the following is not true for Eddy diffusion in chromatography?

- (A) it is related to particle size, geometry and tightness of packing of the stationary phase
- (B) it results in the broadening of the eluted band
- (C) it is independent of flow rate
- (D) it results from the tendency of the molecules to migrate from the concentrated center part of the band towards more dilute regions on either side

Correct Answer: (D) it results from the tendency of the molecules to migrate from the concentrated center part of the band towards more dilute regions on either side

Solution:

Step 1: Understanding the Concept:

The Van Deemter equation $H = A + B/u + Cu$ explains band broadening.

A = Eddy diffusion, B = Longitudinal diffusion, C = Mass transfer.

Step 2: Key Formula or Approach:

Approach: Evaluate the definition of each term in the Van Deemter equation.

Step 3: Detailed Explanation:

- **Eddy Diffusion (A):** Caused by different paths taken by molecules through the packing. It depends on particle size and packing quality but is **independent of flow velocity**.
- **Longitudinal Diffusion (B):** Caused by molecular diffusion from high to low concentration over time. This is what statement (D) describes.
- Statement (D) refers to the B term, not the A term.

Step 4: Final Answer:

Statement (D) is the false statement regarding Eddy diffusion.

💡 Quick Tip

Eddy Diffusion = "Multiple Paths." It stays the same whether the mobile phase flows fast or slow.

16. Which one of the following best describes the country, height of the monument and angle of tilt of this historic monument as shown in the image below?

Correct Answer: Country: Italy; Height: Approximately 56 meters; Angle of tilt: Approximately 4 degrees.

Solution:

Step 1: Understanding the Concept:

The image depicts the famous **Leaning Tower of Pisa** (Torre pendente di Pisa), which is

the campanile, or freestanding bell tower, of the cathedral of the Italian city of Pisa. It is world-renowned for its unintended tilt to one side.

Step 2: Detailed Explanation:

1. **Country:** The tower is located in the Piazza dei Miracoli in the city of Pisa, **Italy**.
2. **Height:** The height of the tower is roughly **55.86 meters** (183.27 feet) from the ground on the low side and **56.67 meters** (185.93 feet) on the high side. For general educational purposes, it is often rounded to **56 meters**.
3. **Angle of Tilt:** The tower began to lean during construction in the 12th century because the soft ground on one side could not properly support the weight of the structure. While the tilt reached about 5.5 degrees in the late 20th century, extensive restoration and stabilization work between 1990 and 2001 reduced the lean. Currently, the tower tilts at an angle of approximately **3.97 to 4 degrees**.

Step 3: Final Answer:

The monument is located in **Italy**, its height is approximately **56 meters**, and its current angle of tilt is about **4 degrees** from the vertical.

 Quick Tip

The Leaning Tower of Pisa remains stable today because its center of gravity still falls within its base area. If the tilt were to increase significantly, it would eventually collapse.

17. In India and as in many other colonies, the growth of modern nationalism is intimately connected to the anti-colonial movement. People began discovering their unity in the process of their struggle with colonialism. The sense of being oppressed under colonialism provided a shared bond that tied many different groups together. But each class and group felt the effects of colonialism differently, their experiences were varied, and their notions of freedom were not always the same. The Congress under Mahatma Gandhi tried to forge these groups together within one movement. But the unity did not emerge without conflict. Which one of the following statements best describes the colonial history?

Correct Answer: (A) Effects of colonialism were felt different by each class and group

Solution:

Step 1: Understanding the Concept:

The provided passage discusses the foundations of modern nationalism in colonized nations like India. It explains that national identity was forged through a collective struggle against colonial rule, which served as a common point of resistance for diverse social groups.

Step 2: Detailed Explanation:

The text highlights a crucial aspect of the nationalist movement: despite a common enemy,

the internal experience of colonial rule was not uniform. It explicitly states, "each class and group felt the effects of colonialism differently, their experiences were varied, and their notions of freedom were not always the same."

This implies that different strata of society—such as the peasantry, the working class, tribal communities, and the burgeoning middle class—faced different forms of exploitation (e.g., high land revenue for farmers vs. lack of job opportunities for the educated youth). Consequently, their motivations for joining the anti-colonial struggle and their vision of 'Freedom' or 'Swaraj' often differed, sometimes leading to internal conflicts even within the larger umbrella of the independence movement. This variety of lived experience is what characterizes colonial history most accurately according to the text.

Step 3: Final Answer:

Based on the direct textual evidence, the statement that best describes colonial history is that the effects of colonialism were felt differently by each class and group.

Quick Tip

In history-based comprehension, pay close attention to statements that qualify general trends. While colonialism was a "unifying" force, the "differences" in experience are usually the focus of deeper analysis in exam questions.

18. Mr A started business by investing 4200, and after 2 months Mr B joined his business by investing 3000. At the end of 4 months from the start of the business, Mr C joined with an investment of 6000. At the end of 10 months from the start of the business, Mr A added an additional amount of 1800. If Mr A's share in the annual profit was 1620, what was the total annual profit?

- (A) 3080
- (B) 3960
- (C) 4070
- (D) 4180

Correct Answer: (B) 3960

Solution:

Step 1: Understanding the Concept:

In a business partnership, the profit is distributed among partners based on the ratio of the product of their investment amounts and the respective time periods for which those amounts remained in the business. For an annual profit, the total duration is considered to be 12 months.

Step 2: Key Formula or Approach:

Ratio of Profit Share = $(\text{Investment}_1 \times \text{Time}_1) : (\text{Investment}_2 \times \text{Time}_2) : \dots$

Step 3: Detailed Explanation:

Let's determine the effective investment (Investment $\times$ Time) for each partner over the 12-month period:

Mr. A's effective investment:

- Mr. A invested 4200 initially for the first 10 months.
- At the end of 10 months, he added 1800, so his investment for the remaining 2 months (12 - 10) became $4200 + 1800 = 6000$.
- Effective investment of A = $(4200 \times 10) + (6000 \times 2) = 42000 + 12000 = 54000$.

Mr. B's effective investment:

- Mr. B joined 2 months after the start, so his investment was active for $12 - 2 = 10$ months.
- Effective investment of B = $3000 \times 10 = 30000$.

Mr. C's effective investment:

- Mr. C joined 4 months after the start, so his investment was active for $12 - 4 = 8$ months.
- Effective investment of C = $6000 \times 8 = 48000$.

Profit Sharing Ratio (A : B : C):

$$A : B : C = 54000 : 30000 : 48000$$

Dividing all terms by their greatest common divisor (6000):

$$A : B : C = \frac{54000}{6000} : \frac{30000}{6000} : \frac{48000}{6000} = 9 : 5 : 8$$

Calculating Total Annual Profit:

Sum of ratio parts = $9 + 5 + 8 = 22$.

Let the total annual profit be P .

$$\text{Mr. A's share} = \frac{\text{A's ratio part}}{\text{Sum of parts}} \times P = \frac{9}{22} \times P$$

Given that Mr. A's share is 1620:

$$\frac{9}{22} \times P = 1620$$

$$P = \frac{1620 \times 22}{9}$$

$$P = 180 \times 22$$

$$P = 3960$$

Step 4: Final Answer:

The total annual profit was 3960.

💡 Quick Tip

To avoid calculation errors in partnership problems, always convert "Joining after x months" into the actual "Investment duration" by subtracting from the total period (e.g., $12 - x$). When investments change mid-period, calculate the product of amount and time for each segment and sum them up to get the total effective investment.

19. A circular copper wire of radius 35 cm is bent to form rectangle. If the length of the rectangle is more than the breadth of the rectangle by 26 cm, then what is the length of the rectangle?

- (A) 62 cm
- (B) 72 cm
- (C) 64 cm
- (D) 68 cm

Correct Answer: (D) 68 cm

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

When a wire is reshaped from one geometric form (a circle) to another (a rectangle), its total length remains the same. This means the circumference of the initial circle is equal to the perimeter of the resulting rectangle.

Step 2: Key Formula or Approach:

1. Circumference of a circle (C) = $2\pi r$, where r is the radius.
2. Perimeter of a rectangle (P) = $2(l + b)$, where l is the length and b is the breadth.

Step 3: Detailed Explanation:

First, calculate the circumference of the circular wire:

Given radius, $r = 35$ cm.

Using $\pi = \frac{22}{7}$:

$$C = 2 \times \frac{22}{7} \times 35$$

$$C = 2 \times 22 \times 5$$

$$C = 220 \text{ cm}$$

This circumference is equal to the perimeter of the rectangle. So, $P = 220$ cm.

Let the breadth of the rectangle be b cm.

According to the question, the length (l) is more than the breadth by 26 cm:

$$l = b + 26$$

Now, use the perimeter formula for the rectangle:

$$2(l + b) = 220$$

$$l + b = 110$$

Substitute $l = b + 26$ into the equation:

$$(b + 26) + b = 110$$

$$2b + 26 = 110$$

$$2b = 110 - 26$$

$$2b = 84$$

$$b = 42 \text{ cm}$$

Finally, find the length:

$$l = b + 26 = 42 + 26 = 68 \text{ cm}$$

Step 4: Final Answer:

The length of the rectangle is 68 cm.

💡 Quick Tip

In "reshaping" problems, the perimeter or circumference remains constant. If you need to find the sum of length and breadth quickly, just divide the perimeter by 2 ($l + b = P/2$). For this question, $l + b = 110$ and $l - b = 26$. You can quickly find l by adding the two equations: $2l = 136 \Rightarrow l = 68$.
