INI CET Physiology

Sample Paper – 5

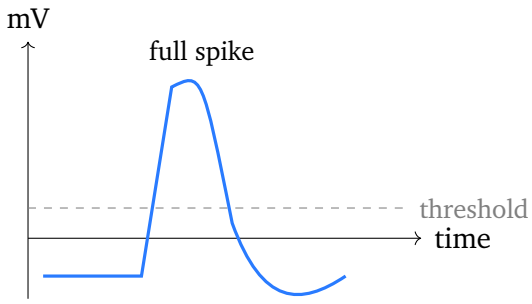
Duration: 14 Minutes **Maximum Marks: 15**

Instructions

- This paper contains **15** Multiple Choice Questions (Single Best Response), modelled on the Physiology content of **INI CET** (Institutes of National Importance Combined Entrance Test) conducted by AIIMS New Delhi.
- The **15-question** length matches the number of Physiology items you actually meet in the real 200-question paper.
- Each correct answer carries **+1 mark**. There is **negative marking of one-third (0.33) mark** for every incorrect answer; unattempted questions carry no penalty.
- Every question has **exactly one best answer**. Choose the single most appropriate option.
- Attempt this practice paper in one timed sitting of about **14 minutes**, the pace the real computer-based test demands.

General, Nerve and Muscle Physiology

Q1. The trace below shows an action potential fired at full amplitude once threshold (dashed line) is crossed. This behaviour illustrates the "all-or-none" law, which states that:



(A) Once the threshold is reached, the impulse fires at its full, constant amplitude regardless of how strong the stimulus is

(B) The amplitude of the action potential grows in proportion to stimulus strength

(C) A subthreshold stimulus produces a small, partial action potential

(D) Each successive action potential in a train has a smaller amplitude

Q2. Which set of properties best describes slow oxidative (type I) skeletal muscle fibres?

(A) Large diameter, few mitochondria, contract rapidly and fatigue quickly

(B) Rich in mitochondria and myoglobin, fatigue resistant, suited to sustained posture

(C) Depend mainly on anaerobic glycolysis with low myoglobin content

(D) White in colour, rapid twitch, quickly exhausted during activity

Q3. Temporal summation of synaptic potentials at a neuron occurs when:

(A) Many different presynaptic terminals are activated at the same instant

(B) An excitatory and an inhibitory input arrive together and cancel out

(C) A single presynaptic terminal fires repeatedly in rapid succession so successive EPSPs add on top of one another

(D) The postsynaptic membrane is driven further from threshold

Blood and Body Fluids

Q4. Warfarin produces its anticoagulant effect by:

(A) Directly inhibiting thrombin in the circulation

(B) Chelating calcium so that clotting cannot proceed

(C) Inhibiting vitamin K epoxide reductase, reducing synthesis of factors II, VII, IX and X

(D) Enhancing the activity of antithrombin III

Q5. The plasma protein chiefly responsible for the colloid osmotic (oncotic) pressure of blood is:

(A) Fibrinogen

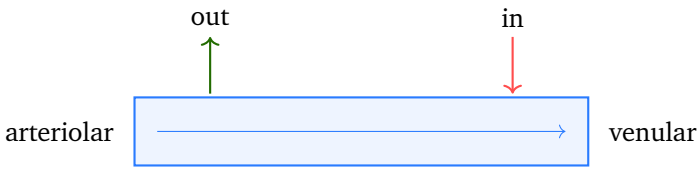
(B) Gamma globulin

(C) Haemoglobin

(D) Albumin

Cardiovascular System

Q6. In the capillary shown, the vertical arrows mark the net direction of fluid movement at each end. Applying the Starling forces, fluid is:



(A) Reabsorbed at both the arteriolar and venular ends

(B) Filtered out at both the arteriolar and venular ends

(C) Filtered out at the arteriolar end and reabsorbed at the venular end

(D) Reabsorbed at the arteriolar end and filtered out at the venular end

Q7. The first heart sound (S1), heard at the start of ventricular systole, is produced mainly by:

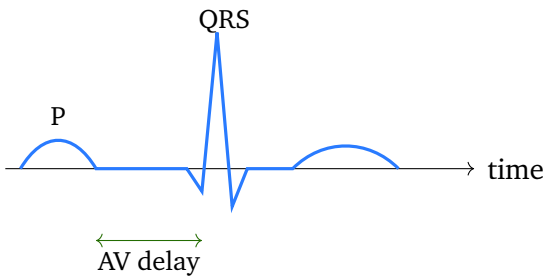
(A) Closure of the aortic and pulmonary (semilunar) valves

(B) Closure of the mitral and tricuspid (atrioventricular) valves

(C) Opening of the semilunar valves during ejection

(D) The rush of blood during rapid ventricular filling

Q8. On the electrocardiogram below, the flat segment between the P wave and the QRS complex reflects the delay produced at the atrioventricular (AV) node. This AV nodal delay is physiologically important because it:



(A) Speeds conduction so the ventricles contract sooner

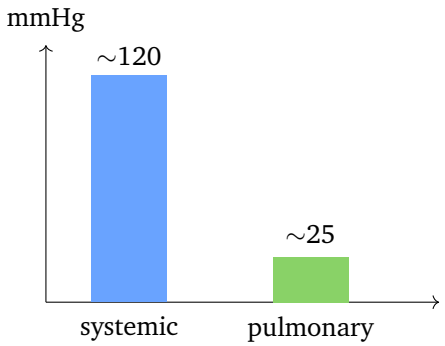
(B) Prevents the sinoatrial node from firing again

(C) Generates the QRS complex directly

(D) Allows time for complete atrial emptying into the ventricles before they contract

Respiratory System

Q9. The bars compare the peak (systolic) pressure in a systemic artery with that in the pulmonary artery. Compared with the systemic circulation, the pulmonary circulation is best described as:



(A) A low-pressure, low-resistance system

(B) A high-pressure, high-resistance system

(C) A high-pressure, low-resistance system

(D) A low-pressure, high-resistance system

Q10. In an alveolus that is poorly ventilated, the local alveolar PO_2 falls. The pulmonary arterioles supplying that region respond by:

(A) Constricting, diverting blood toward better-ventilated alveoli

(B) Dilating, increasing blood flow to the hypoxic region

(C) Failing to respond to local oxygen levels at all

(D) Constricting only when the systemic PO_2 rises

Renal System

Q11. Which nephron segment reabsorbs roughly 65% of the filtered load isosmotically, so that the fluid leaving it has essentially the same osmolality as plasma?

(A) Thick ascending limb of the loop of Henle

(B) Distal convoluted tubule

(C) Cortical collecting duct

(D) Proximal convoluted tubule

Q12. Atrial natriuretic peptide, released when the cardiac atria are stretched by a rise in blood volume, acts on the kidney to:

(A) Increase the excretion of sodium and water, lowering blood volume

(B) Increase sodium reabsorption in the proximal tubule

(C) Reduce the glomerular filtration rate and conserve water

(D) Stimulate renin release from the juxtaglomerular cells

Gastrointestinal, Endocrine and Neurophysiology

Q13. Intrinsic factor, which is required for the absorption of vitamin B_{12} in the terminal ileum, is secreted by:

(A) Chief (peptic) cells of the stomach

(B) G cells of the gastric antrum

(C) Parietal (oxyntic) cells of the gastric mucosa

(D) Paneth cells of the small intestine

Q14. In the hypothalamo-pituitary-adrenal axis, ACTH from the anterior pituitary stimulates cortisol release from the adrenal cortex. A rise in plasma cortisol then:

(A) Increases CRH and ACTH secretion still further

(B) Suppresses CRH and ACTH secretion by negative feedback

(C) Has no effect on the hypothalamus or pituitary

(D) Stimulates the adrenal medulla to release adrenaline

Q15. Fine (discriminative) touch, vibration and conscious proprioception are carried from the body to the cerebral cortex mainly by the:

(A) Anterolateral spinothalamic tract

(B) Dorsal column-medial lemniscus pathway

(C) Lateral corticospinal tract

(D) Dorsal spinocerebellar tract

Detailed Solutions

Q1.

Solution

Concept – the all-or-none law: An excitable membrane either fires a full action potential or it does not fire at all.

Step 1 – read the trace: The stimulus crosses the dashed threshold, and the spike shoots up to its full height.

Step 2 – state the law: Once threshold is reached, the action potential fires at a fixed, maximal amplitude that does not depend on how strong the stimulus was.

Why the other options are wrong:

- B: amplitude is constant, not graded by stimulus strength.
- C: a subthreshold stimulus produces no action potential at all.
- D: within a fibre each fully recovered spike has the same amplitude.

Final Answer: Fires at full, constant amplitude once threshold is crossed $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept – skeletal muscle fibre types: Type I (slow oxidative) fibres are built for endurance, type II (fast glycolytic) for speed.

Step 1 – describe type I: They are **rich in mitochondria and myoglobin**, have a good blood supply, and resist fatigue.

Step 2 – link to function: This suits them to sustained, low-force work such as maintaining posture.

Why the other options are wrong:

- A: large diameter with few mitochondria describes fast type II fibres.
- C: reliance on anaerobic glycolysis with low myoglobin is a type II feature.
- D: white colour and rapid exhaustion describe fast glycolytic fibres.

Final Answer: Mitochondria- and myoglobin-rich, fatigue resistant $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept – summation of synaptic potentials: Single EPSPs are usually too small to reach threshold, so they must add together.

Step 1 – define temporal summation: One presynaptic terminal fires repeatedly in rapid succession, and each new EPSP arrives before the previous one has decayed, so they build up.

Step 2 – contrast spatial summation: Spatial summation instead adds EPSPs from *many different* terminals firing at the same moment.

Why the other options are wrong:

- A: many terminals firing together is spatial, not temporal, summation.
- B: an EPSP plus an IPSP cancelling is not summation toward threshold.
- D: summation drives the membrane toward threshold, not away from it.

Final Answer: One terminal firing repeatedly so EPSPs add up $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept – warfarin and vitamin K: Several clotting factors need a vitamin-K-dependent step to become active.

Step 1 – name the target: Warfarin **inhibits vitamin K epoxide reductase**, blocking regeneration of active (reduced) vitamin K.

Step 2 – the consequence: Without active vitamin K, the liver cannot fully carboxylate factors II, VII, IX and X, so functional clotting factors fall.

Why the other options are wrong:

- A: direct thrombin inhibition describes drugs like dabigatran, not warfarin.
- B: calcium chelation is an in-vitro anticoagulant action (for example citrate), not warfarin's mechanism.
- D: enhancing antithrombin III is how heparin works.

Final Answer: Inhibits vitamin K epoxide reductase $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept – colloid osmotic (oncotic) pressure: Large plasma proteins that stay in the vessel hold water in the blood.

Step 1 – identify the key protein: Albumin is the most abundant plasma protein and, being small and numerous, contributes most of the oncotic pressure.

Step 2 – clinical link: A low plasma albumin lowers oncotic pressure and favours oedema.

Why the other options are wrong:

- A: fibrinogen is present in much smaller amounts.
- B: gamma globulins are large and far fewer, so they add little oncotic pull.
- C: haemoglobin is inside red cells, not free in plasma.

Final Answer: Albumin $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q5

Q6.

Solution

Concept – Starling forces across a capillary: The balance of hydrostatic and oncotic pressures decides the direction of fluid movement.

Step 1 – the arteriolar end: Here capillary hydrostatic pressure is high and exceeds the opposing oncotic pressure, so fluid is **filtered outward**.

Step 2 – the venular end: Hydrostatic pressure has fallen along the capillary, so the plasma oncotic pressure now dominates and fluid is **reabsorbed inward**.

Why the other options are wrong:

- A: net reabsorption at both ends would ignore the high arteriolar hydrostatic pressure.
- B: net filtration at both ends would ignore the fall in pressure downstream.
- D: the directions are reversed; filtration is at the arteriolar, not the venular, end.

Final Answer: Filtered at the arteriolar end, reabsorbed at the venular end $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q6

Q7.

Solution

Concept – the heart sounds: Each sound is timed to the closure of a set of valves.

Step 1 – identify S1: The first heart sound marks **closure of the mitral and tricuspid (atrioventricular) valves** as ventricular systole begins.

Step 2 – contrast S2: The second heart sound is the closure of the aortic and pulmonary (semilunar) valves at the end of systole.

Why the other options are wrong:

- A: semilunar valve closure produces S2, not S1.
- C: valve opening is normally silent.
- D: rapid filling can give a third sound (S3), not S1.

Final Answer: Closure of the atrioventricular valves $\Rightarrow$ B

Answer: (B) Go Back to Q7

Q8.

Solution

Concept – the AV nodal delay: Conduction slows markedly as the impulse passes through the AV node.

Step 1 – read the ECG: The flat stretch between the P wave and the QRS is the delay imposed at the AV node.

Step 2 – state its purpose: This pause **allows the atria to finish emptying their blood into the ventricles before the ventricles contract**, optimising filling.

Why the other options are wrong:

- A: the node slows conduction, it does not speed it up.
- B: it does not control when the SA node fires.
- C: the QRS is generated by ventricular depolarisation through the His-Purkinje system, not by the delay itself.

Final Answer: Allows complete atrial emptying before ventricular contraction $\Rightarrow$ D

Answer: (D) Go Back to Q8

Q9.

Solution

Concept – pulmonary versus systemic circulation: The right heart pumps the same output as the left but against far less resistance.

Step 1 – read the bars: Systemic systolic pressure is about 120 mmHg, while pulmonary systolic pressure is only about 25 mmHg.

Step 2 – classify the pulmonary circuit: Because pressure is low yet blood flow is high, the pulmonary bed must be a **low-pressure, low-resistance system**.

Why the other options are wrong:

- B: high pressure and high resistance describe the systemic circulation.
- C: pulmonary pressure is low, not high.
- D: with such low pressure and high flow, resistance must be low, not high.

Final Answer: Low-pressure, low-resistance system $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q9

Q10.

Solution

Concept – hypoxic pulmonary vasoconstriction: The lung matches perfusion to ventilation, the opposite response to systemic vessels.

Step 1 – the local response: When alveolar PO_2 falls, the local pulmonary arterioles **constrict**.

Step 2 – the benefit: Constriction diverts blood away from the poorly ventilated alveoli toward better-ventilated regions, protecting gas exchange.

Why the other options are wrong:

- B: dilating would waste blood flow on unventilated alveoli (systemic vessels dilate to hypoxia, pulmonary do the reverse).
- C: pulmonary arterioles are highly sensitive to local oxygen.
- D: the trigger is low local alveolar PO_2, not a rise in systemic PO_2.

Final Answer: Constrict, diverting blood to better-ventilated alveoli $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q10

Q11.

Solution

Concept – bulk reabsorption in the nephron: Most of the filtered fluid is recovered early, before fine tuning occurs.

Step 1 – name the segment: The **proximal convoluted tubule** reabsorbs about 65% of the filtered water and sodium.

Step 2 – why it is isosmotic: Water follows the reabsorbed solute freely here, so the fluid stays roughly iso-osmotic with plasma.

Why the other options are wrong:

- A: the thick ascending limb reabsorbs solute but is water impermeable, diluting the fluid.
- B: the distal convoluted tubule handles a small, regulated fraction.
- C: the collecting duct performs the final, hormone-controlled adjustment.

Final Answer: Proximal convoluted tubule $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q11

Q12.

Solution

Concept – atrial natriuretic peptide (ANP): ANP is a volume-lowering hormone released by stretched atria.

Step 1 – the renal action: ANP **increases the excretion of sodium and water**, reducing blood volume and pressure.

Step 2 – how: It raises GFR and inhibits sodium reabsorption, and it opposes renin, aldosterone and ADH.

Why the other options are wrong:

- B: ANP reduces, not increases, tubular sodium reabsorption.
- C: ANP tends to raise GFR, not lower it.
- D: ANP suppresses renin release rather than stimulating it.

Final Answer: Increases sodium and water excretion $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q12

Q13.

Solution

Concept – intrinsic factor and vitamin B_{12}: Vitamin B_{12} can only be absorbed when bound to intrinsic factor.

Step 1 – name the source cell: Parietal (oxyntic) cells of the stomach secrete intrinsic factor.

Step 2 – the pathway: The intrinsic-factor–B_{12} complex is absorbed in the terminal ileum; loss of parietal cells causes pernicious anaemia.

Why the other options are wrong:

- A: chief cells secrete pepsinogen, not intrinsic factor.
- B: G cells secrete the hormone gastrin.
- D: Paneth cells secrete antimicrobial defensins and lysozyme.

Final Answer: Parietal (oxyntic) cells $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q13

Q14.

Solution

Concept – the hypothalamo-pituitary-adrenal axis: The axis is regulated by negative feedback from its final hormone.

Step 1 – trace the axis: CRH drives ACTH, and ACTH drives cortisol from the adrenal cortex.

Step 2 – the feedback: Rising cortisol **suppresses both CRH and ACTH**, keeping the system in check.

Why the other options are wrong:

- A: increasing CRH and ACTH would be positive feedback, which this axis does not use for control.
- C: cortisol acts on both the hypothalamus and the pituitary.
- D: the adrenal medulla and adrenaline are driven by sympathetic nerves, not by cortisol feedback.

Final Answer: Suppresses CRH and ACTH by negative feedback $\Rightarrow$ $\boxed{B}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept – ascending sensory pathways: Different modalities travel in separate spinal tracts.

Step 1 – name the pathway: Fine touch, vibration and conscious proprioception ascend in the **dorsal column-medial lemniscus pathway**.

Step 2 – its route: Fibres run up the dorsal columns, synapse in the medulla, cross, and travel via the medial lemniscus to the thalamus and cortex.

Why the other options are wrong:

- A: the spinothalamic tract carries pain and temperature.
- C: the corticospinal tract is a motor (descending) pathway.
- D: the spinocerebellar tract carries unconscious proprioception to the cerebellum.

Final Answer: Dorsal column-medial lemniscus pathway $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q15

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	C	4	C	5	D
6	C	7	B	8	D	9	A	10	A
11	D	12	A	13	C	14	B	15	B