NEET MDS Dental Anatomy and Oral Histology

Sample Paper – 7

Duration: 11 Minutes **Maximum Marks: 56**

Instructions

- This paper contains **14** Multiple Choice Questions (Single Best Response), modelled on the Dental Anatomy, Embryology and Oral Histology content of **NEET MDS** conducted by NBEMS.
- The **14-question** length matches the number of Dental Anatomy and Oral Histology items you actually meet in the real 240-question paper.
- Each correct answer carries **+4 marks**. There is **negative marking of 1 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 **11 minutes**, the pace the real computer-based test demands.

Permanent Tooth Morphology

Q1. In the permanent dentition, the teeth with the smallest mesiodistal width, and whose lingual surfaces carry only a faint cingulum with marginal ridges that are barely discernible, are the:

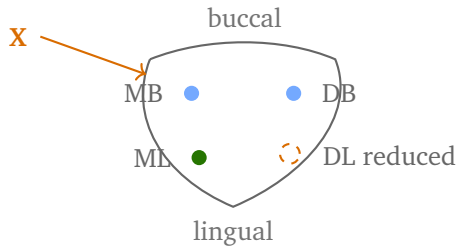
(A) Maxillary lateral incisors

(B) Mandibular canines

(C) Mandibular incisors

(D) Maxillary second premolars

Q2. The occlusal outline marked **X** below is heart-shaped, carries only three functional cusps, and shows a distolingual cusp that is reduced to a dotted remnant or is absent altogether. This outline belongs to the:



(A) Maxillary third molar

(B) Mandibular third molar

(C) Maxillary first molar

(D) Mandibular second molar

Q3. In a multirooted tooth, the root trunk is the distance from the cementoenamel junction to the entrance of the furcation. A **short** root trunk is clinically important in periodontal disease because:

(A) It places the furcation entrance far apically, so the furcation is shielded from attachment loss for the life of the tooth

(B) Only a small amount of attachment loss is needed before the furcation entrance is reached, so furcation involvement appears early

(C) The roots of such a tooth are fused, so no furcation entrance exists at all

(D) The furcation entrance lies coronal to the cementoenamel junction, so it is already open to the mouth in health

Q4. In normal centric occlusion, the relationship of the **buccal cusps of the maxillary posterior teeth** to the lower arch is best described as:

(A) They overhang the buccal surfaces of the mandibular posterior teeth as non-supporting guiding cusps, while the maxillary lingual cusps occupy the mandibular fossae and marginal ridges

(B) They occupy the central fossae of the mandibular molars and act as the supporting cusps of the upper arch

(C) They contact the lingual cusps of the mandibular posterior teeth tip to tip, holding the vertical dimension

(D) They are the only maxillary cusps in contact in centric occlusion, the lingual cusps being held clear of the lower arch

Deciduous Dentition and Eruption

Q5. A paediatrician refers a newborn with a mobile tooth already visible in the mouth on the day of birth. Regarding natal and neonatal teeth, the correct statement is:

(A) A natal tooth is one that erupts within the first 30 days of life and a neonatal tooth is one present at birth; the maxillary first molar region is most often involved

(B) Both terms describe teeth present at the moment of birth, and the maxillary central incisor region is most often involved

(C) The great majority of such teeth are supernumerary, and they must therefore always be extracted

(D) A natal tooth is present at birth and a neonatal tooth erupts within the first 30 days of life; the mandibular central incisor region is by far the commonest site

Q6. While cutting a Class I cavity in a deciduous mandibular first molar of a 4-year-old, the operator exposes the pulp at a depth that would have been perfectly safe in a permanent molar. The feature that best explains this is:

(A) The pulp chamber is relatively large and its mesiobuccal pulp horn projects high, coming very close to the occlusal surface

(B) The pulp chamber of a deciduous molar is smaller than that of a permanent molar and lies further apically

(C) Deciduous enamel and dentine are thicker, so a deeper cut is needed and the pulp is met without warning

(D) Deciduous molars possess no pulp horns, so exposure can only occur through an accessory canal in the pulpal floor

Enamel

Q7. Regarding developmental defects of enamel and the histological picture of dental fluorosis, the correct statement is:

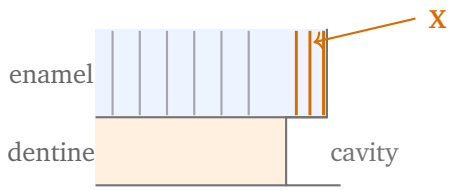
(A) Hypoplasia is a qualitative defect of mineralisation, while fluorosis is a quantitative loss of enamel matrix

(B) Hypoplasia and hypomineralisation both reduce the thickness of enamel, and neither alters its mineral content

(C) In fluorosis the surface enamel is the most porous zone and the deeper enamel is entirely normal

(D) Hypoplasia is a quantitative defect of matrix secretion producing pits and grooves, whereas fluorosis is essentially hypomineralisation, a qualitative defect, with a well mineralised surface layer over porous subsurface enamel

Q8. In the cavity preparation drawn below, the wall of enamel marked **X** has been left standing after the dentine beneath it was removed. The correct statement about enamel rod direction and this margin is:



(A) Enamel rods run roughly perpendicular to the dentinoenamel junction, and enamel whose rods do not rest on sound dentine fractures under occlusal load, so the enamel at **X** must be removed

(B) Enamel rods run parallel to the dentinoenamel junction, so enamel draws its strength from the surface and **X** may safely be left standing

(C) Enamel rods are supported by the enamel cuticle rather than by dentine, so **X** will not fracture

(D) The rods at **X** will be re-supported by newly formed enamel once the restoration is placed

Dentine and Pulp

Q9. The moment a cavity is cut with a rotary bur, the prepared dentine surface is covered by a smear layer. The correct statement about it is:

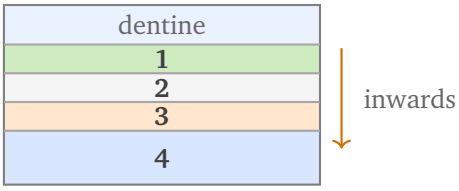
(A) It is a layer of reparative dentine laid down within minutes of instrumentation, and it raises dentine permeability

(B) It is a thin layer of cut dentine debris, roughly 1 to 5 micrometres thick, which plugs the tubule orifices and lowers dentine permeability, and which must be removed or modified by acid etching before adhesive bonding

(C) It is a sterile layer of denatured collagen that acid etching cannot dissolve, so it is left undisturbed under every restoration

(D) It opens the tubule orifices and therefore increases dentine permeability, which is why fluid flow and sensitivity rise immediately after preparation

Q10. The diagram shows the histological zones of the coronal pulp as bands, numbered **1** to **4** in order from the dentine inwards. The correct order is:



(A) Cell-free zone of Weil, odontoblast layer, pulp core, cell-rich zone

(B) Odontoblast layer, cell-rich zone, cell-free zone of Weil, pulp core

(C) Odontoblast layer, cell-free zone of Weil, cell-rich zone, pulp core

(D) Pulp core, cell-rich zone, cell-free zone of Weil, odontoblast layer

Cementum and Periodontal Ligament

Q11. A patient with an inflamed pulp cannot say which tooth is aching, yet when the dentist taps the teeth one by one the patient identifies the offending tooth at once. The best explanation is:

(A) The pulp carries proprioceptive receptors, but inflammation temporarily switches them off

(B) Pulpal pain is precisely localised whereas periodontal pain is diffuse, so the tapping test is unreliable

(C) The periodontal ligament is avascular and aneural, so the touch is registered by receptors within the alveolar bone

(D) The periodontal ligament is richly vascular and carries mechanoreceptors and proprioceptive endings, so it localises pressure on a single tooth exactly, whereas the pulp holds only free nerve endings that signal pain without any proprioception

Q12. Regarding the thickness of cementum through life, the correct statement is:

(A) Cementum thickness is fixed once the tooth erupts, and thereafter it can only fall through resorption

(B) Cementum continues to be deposited throughout life, so its thickness increases roughly threefold between about 16 and 70 years of age, the gain being greatest in the apical region

(C) Cementum is remodelled continuously like alveolar bone, so deposition and resorption balance and the thickness stays constant

(D) Cementum thickens most in the cervical third, because that is where the periodontal fibre bundles are densest

Oral Mucosa, Salivary Glands and TMJ Histology

Q13. A 30-year-old man has multiple small, painless, yellowish-white granular spots on the buccal mucosa opposite the molars. They have been present for years, they do not rub off and they cause no symptoms. A biopsy shows lobules of sebaceous glands lying in the lamina propria with no associated hair follicle. The correct interpretation is:

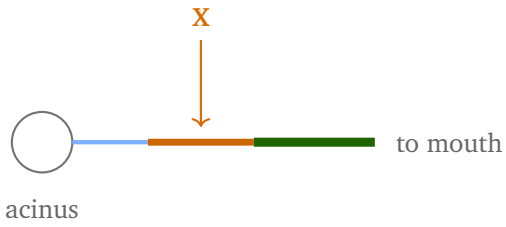
(A) Pseudomembranous candidiasis, which needs antifungal therapy

(B) Fordyce granules, that is ectopic sebaceous glands, a normal anatomical variant needing only reassurance

(C) Homogeneous leukoplakia, which needs excision and long-term follow-up

(D) Ectopic sebaceous tissue that carries a high malignant potential and must therefore be excised

Q14. The salivary duct system is drawn below running from the acinus to the mouth. Segment **X** is lined by columnar cells whose basal membrane is deeply infolded and packed with mitochondria, and it is the segment that reabsorbs sodium and secretes potassium, leaving the final saliva hypotonic. The correct sequence, and the identity of **X**, are:



(A) Acinus, striated duct, intercalated duct, excretory duct; **X** is the intercalated duct

(B) Acinus, intercalated duct, excretory duct, striated duct; **X** is the excretory duct

(C) Acinus, intercalated duct, striated duct, excretory duct; **X** is the striated duct

(D) Acinus, excretory duct, striated duct, intercalated duct; **X** is the striated duct

Detailed Solutions

Q1.

Solution

Concept – the mandibular incisors are the smallest teeth in the mouth: Two clues are given, the mesiodistal width and the state of the lingual surface, and both point to the same group.

Step 1 – take the width clue: The mandibular central incisor is about 5.0 mm wide mesiodistally and the mandibular lateral incisor about 5.5 mm. No other permanent tooth is that narrow.

Step 2 – compare with the nearest rivals: The maxillary lateral incisor is roughly 6.5 mm wide, and the premolars are about 7 mm. The mandibular incisors as a group are therefore the narrowest teeth mesiodistally.

Step 3 – take the lingual clue: On the mandibular incisors the cingulum is faint and low, and the mesial and distal marginal ridges are so shallow that the lingual surface reads as a smooth, gently concave fossa rather than a scooped-out lingual fossa with sharp borders.

Step 4 – explain why the anatomy is so plain: These teeth take the smallest share of the occlusal load, and they are the last incisors to be involved in guidance, so their lingual anatomy stays poorly developed. The mandibular central incisor is also the most symmetrical tooth in the mouth for the same reason.

Step 5 – note the clinical value: Because the lingual surface is smooth and the crown is narrow, the mandibular incisors are the commonest site of calculus deposition, sitting as they do opposite the openings of Wharton's duct.

Why the other options are wrong:

- A, the maxillary lateral incisors: are narrow for a maxillary tooth but still wider than the mandibular incisors, and their lingual surface is the opposite of plain. It has a well marked cingulum, prominent marginal ridges, a deep lingual fossa and a lingual pit.
- B, the mandibular canines: are longer and wider than the mandibular incisors, and their lingual surface carries a distinct cingulum and a lingual ridge.
- D, the maxillary second premolars: are about 7 mm wide mesiodistally and carry a fully formed lingual cusp, so neither clue fits.

Final Answer: Mandibular incisors $\Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – the occlusal outline names the molar: Each molar has its own occlusal silhouette, and the silhouette follows the fate of the distolingual cusp.

Step 1 – read the shape given: The outline is **heart-shaped**, that is, wide buccally and tapering to a rounded point lingually.

Step 2 – read the cusp count: Only three functional cusps are present, mesiobuccal, distobuccal and mesiolingual, exactly as the diagram marks them.

Step 3 – link the two: The heart shape exists precisely *because* the distolingual cusp has shrunk or vanished. Lose that fourth corner and the rhomboid outline collapses into a heart.

Step 4 – name the tooth: That is the classic picture of the **maxillary third molar**, the most reduced tooth of the maxillary molar series.

Step 5 – confirm with the rest of the tooth: The maxillary third molar also shows fused, short, curved roots and no oblique ridge worth the name, both of which fit the same story of progressive reduction from first to third molar.

Why the other options are wrong:

- B, the mandibular third molar: is reduced too, but its outline is an irregular oval or rounded rhomboid, and its reduction shows as fused roots and a wrinkled, unpredictable groove pattern, not as a heart-shaped outline with a lost distolingual cusp.
- C, the maxillary first molar: is the least reduced tooth of the series. It has four well formed cusps plus the cusp of Carabelli, a rhomboid outline and a strong oblique ridge.
- D, the mandibular second molar: has four cusps of nearly equal size in a plus-shaped groove pattern, and a rectangular outline.

Final Answer: Maxillary third molar $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q2

Q3.

Solution

Concept – the root trunk decides when a furcation gets involved: The root trunk is simply the undivided part of the root, and its length sets the depth of attachment loss at which the furcation is breached.

Step 1 – define the measurement: Root trunk length is measured from the cementoenamel junction down to the roof of the furcation, that is, to the furcation entrance.

Step 2 – picture attachment loss travelling apically: Periodontal attachment loss begins at the cementoenamel junction and progresses apically. The attachment level has to travel the whole length of the root trunk before it reaches the furcation entrance.

Step 3 – shorten the trunk: If the trunk is short, that journey is short. A modest amount of attachment loss, sometimes only 3 to 4 mm, already opens the furcation.

Step 4 – state the consequence: Furcation involvement therefore appears **early** in the disease, while the tooth still has plenty of remaining support. This is why maxillary first premolars and many mandibular first molars develop furcation problems ahead of teeth with long trunks.

Step 5 – note the treatment angle: Once the furcation is open, plaque control becomes very difficult, because the furcation entrance in most molars is narrower than the blade of a standard curette. That is exactly why furcation involvement worsens the prognosis so sharply.

Step 6 – read option A as the mirror image: A long root trunk is the protective situation, since the furcation sits far apically and is reached only late.

Why the other options are wrong:

- A, furcation shielded for the life of the tooth: describes a **long** root trunk, and even then the protection is relative, not permanent. It is the exact reverse of what a short trunk does.
- C, fused roots and no furcation: confuses two different things. Root fusion is a separate anatomical variant, and a tooth may have a short trunk with fully separated, divergent roots.
- D, furcation entrance coronal to the cementoenamel junction: does not occur. By definition the furcation lies apical to the cementoenamel junction; a short trunk brings it closer to that junction but never above it.

Final Answer: Little attachment loss is needed to expose the furcation $\Rightarrow$ B

Answer: (B) Go Back to Q3

Q4.

Solution

Concept – supporting and non-supporting cusps: Of the four cusp rows in the posterior segments, only two hold the vertical dimension. The other two guide and protect.

Step 1 – identify the supporting cusps: The supporting, or centric holding, cusps are the **lingual cusps of the maxillary** posterior teeth and the **buccal cusps of the mandibular** posterior teeth. They are the inner rows on each arch.

Step 2 – see where they land: Each supporting cusp seats into a fossa or against a marginal ridge of the opposing tooth, giving the cusp-fossa and cusp-marginal-ridge contacts of centric occlusion, and it is these contacts that hold the vertical dimension.

Step 3 – turn to the maxillary buccal cusps: They are the outer row of the upper arch. Because the maxillary arch is wider than the mandibular one, they lie **buccal to** the mandibular buccal cusps and overhang the buccal surfaces of the lower teeth. That overhang is the posterior horizontal overlap.

Step 4 – state their role: Sitting outside the lower arch, they do not seat into any lower fossa. They are **non-supporting** cusps. Their jobs are to guide the mandible in working excursion, to keep the buccal mucosa and cheek out of the occlusal table, and to shear food onto that table.

Step 5 – assemble the picture and match it: Maxillary buccal cusps overhang the lower buccal surfaces and support nothing; maxillary lingual cusps drop into the lower fossae and marginal ridges and carry the load. That is option A word for word.

Step 6 – note the clinical use: When you restore an upper molar you may adjust the buccal cusp for aesthetics and guidance, but you must not lose the lingual cusp contact, because that contact is what maintains the occlusal vertical dimension.

Why the other options are wrong:

- B, buccal cusps in the mandibular central fossae: reverses the roles. It is the maxillary **lingual** cusp that occupies the mandibular central fossa; the maxillary buccal cusp lies well outside the lower arch.
- C, tip-to-tip contact with the mandibular lingual cusps: describes no normal relationship at all. The mandibular lingual cusps are the innermost row, and they are non-supporting cusps of the lower arch.
- D, only cusps in contact in centric: is the exact opposite of the truth. The maxillary buccal cusps are the row that is **not** in holding contact, while the lingual cusps are.

Final Answer: Non-supporting cusps overhanging the lower buccal surfaces $\Rightarrow$ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – teeth that arrive far too early: The two terms differ only in timing, and the timing is measured from the moment of birth.

Step 1 – define the natal tooth: A **natal tooth** is one that is already **present in the mouth at birth**. Massler and Savara set the terminology, and the word natal refers to birth itself.

Step 2 – define the neonatal tooth: A **neonatal tooth** is one that erupts during the **neonatal period**, that is, within the first **30 days** of life. The word neonatal refers to the month after birth.

Step 3 – locate the commonest site: Roughly 85 percent of these teeth are in the **mandibular central incisor** region. Maxillary incisors are a distant second, and molar sites are rare.

Step 4 – state what they usually are: About 90 percent are **prematurely erupted normal deciduous teeth**, not supernumeraries. Only around 10 percent are true supernumerary teeth.

Step 5 – draw the management conclusion: Because most are the child's own deciduous incisors, they should be retained if they are reasonably stable. A radiograph settles whether the tooth is part of the normal series. Extraction is reserved for a tooth so mobile that aspiration is a risk, or one causing Riga-Fede ulceration of the ventral tongue that does not settle with smoothing of the incisal edge.

Step 6 – match the options: Only option D gets both definitions the right way round and names the mandibular central incisor region.

Why the other options are wrong:

- A, the definitions swapped and a maxillary molar site: is wrong twice over. Natal means present at birth, not erupting within 30 days, and the mandibular incisor region, not a molar region, is the usual site.
- B, both terms meaning present at birth: erases the whole distinction. The two words exist precisely to separate teeth present at birth from teeth erupting in the first month. The site named is also wrong.
- C, mostly supernumerary and always extract: inverts the statistics. About 90 percent are prematurely erupted teeth of the normal deciduous series, and routine extraction would leave the child with an unnecessary anterior space

for years.

Final Answer: Natal at birth, neonatal within 30 days, mandibular central incisor commonest $\Rightarrow$ D

Answer: (D) Go Back to Q5

Q6.

Solution

Concept – the deciduous pulp chamber sits much closer to the surface than it looks: The outline of a deciduous molar is small, but the pulp inside it is proportionally huge and its horns rise steeply.

Step 1 – take the size of the chamber: The deciduous pulp chamber is **large relative to the crown**. It occupies far more of the crown volume than the chamber of a permanent molar does.

Step 2 – take the height of the horns: The pulp horns are **high and pointed**, and the **mesiobuccal horn is the highest of all**. In a deciduous mandibular first molar it rises almost to the level of the mesiobuccal cusp.

Step 3 – add the thin overlying tissue: Deciduous enamel is only about 1 mm thick and the dentine over the horn is thin as well. Chamber plus horn plus thin covering means very little sound tissue separates the bur from the pulp.

Step 4 – apply it to the cavity: A depth of about 1.5 mm from the occlusal surface, entirely routine in a permanent molar, can carry the bur straight into the mesiobuccal horn of a deciduous molar. That is exactly the accident described in the stem.

Step 5 – state the preparation rule that follows: Keep the pulpal floor shallow, roughly 0.5 mm into dentine, keep the isthmus narrow, avoid extending the preparation towards the mesiobuccal line angle, and use the smallest bur that will do the job.

Why the other options are wrong:

- B, smaller chamber lying further apically: is the reverse of the truth and would predict the opposite accident. A small, deep chamber would make exposure *less* likely, not more.
- C, thicker enamel and dentine: is false. Deciduous enamel and dentine are distinctly **thinner** than their permanent counterparts, which is another reason the pulp is reached so quickly.
- D, no pulp horns at all: is simply untrue. Deciduous molars have prominent

pulp horns, and their prominence is the entire point of the question.

Final Answer: Large chamber with a high mesiobuccal pulp horn $\Rightarrow$ A

Answer: (A) Go Back to Q6

Q7.

Solution

Concept – how much enamel there is versus how good the enamel is: Every developmental enamel defect is either a fault of quantity or a fault of quality, and the two arise at different stages of amelogenesis.

Step 1 – define hypoplasia: Enamel **hypoplasia** is a **quantitative** defect. The insult falls during the **secretory** stage, so too little matrix is laid down. The result is enamel of reduced thickness, showing as pits, horizontal grooves or, at worst, a total absence of enamel over an area. The enamel that is present is normally mineralised and hard.

Step 2 – define hypomineralisation: Enamel **hypomineralisation** is a **qualitative** defect. The insult falls during the **maturation** stage, so a full thickness of matrix is present but it is incompletely mineralised. The enamel is of normal thickness but it is opaque, porous and soft.

Step 3 – classify fluorosis: Excess fluoride during amelogenesis disturbs the removal of matrix proteins during maturation. Dental fluorosis is therefore fundamentally a **hypomineralisation**, that is, a qualitative defect.

Step 4 – describe the histology of fluorosis: The characteristic picture is a **well mineralised, relatively hypermineralised surface layer** of about 20 to 30 micrometres, sitting over an increasingly **porous, hypomineralised subsurface** enamel. The porosity scatters light, and that is what produces the chalky white opaque lines and patches.

Step 5 – explain the brown stain and the pitting: The brown discolouration of moderate fluorosis is post-eruptive. Pigment from the diet is taken up through the porous surface after the tooth is in the mouth; it is not present at eruption. In severe fluorosis the weak subsurface enamel collapses under function and the intact surface layer breaks away, giving pitting. That pitting is a post-eruptive fracture, not true hypoplasia.

Step 6 – match the option: Option D states the quantitative-versus-qualitative split correctly and gets the fluorosis histology the right way round.

Why the other options are wrong:

- A, the two terms swapped: is the commonest error in this topic. Hypoplasia is quantitative, not qualitative, and fluorosis is a mineralisation defect, not a loss of matrix.
- B, both reduce thickness with normal mineral content: is wrong on both halves. Hypomineralisation leaves the **thickness normal** and reduces the mineral content, which is exactly what the option denies.
- C, porous surface over normal deep enamel: is the fluorosis picture turned inside out. The surface layer is the **best** mineralised zone and the subsurface is the porous one, which is why very mild fluorosis feels smooth and hard yet looks chalky.

Final Answer: Hypoplasia is quantitative; fluorosis is hypomineralisation with a sound surface over porous subsurface enamel $\Rightarrow$ D

Answer: (D) Go Back to Q7

Q8.

Solution

Concept – enamel is strong in one direction only: Enamel is a bundle of rods, and a bundle of rods carries load along its length but splits easily between its members.

Step 1 – fix the rod direction: Enamel rods run from the **dentinoenamel junction to the enamel surface**, meeting the junction at roughly a **right angle** and following a gently curved course, as the diagram shows.

Step 2 – see where each rod ends: Every rod has one end anchored on the dentinoenamel junction. Dentine is the resilient tissue that receives the load transmitted down the rod.

Step 3 – see why the anchorage matters: Enamel is about 96 percent mineral, so it is very hard but brittle, with a low tensile strength. It survives occlusal load only because the elastic dentine beneath it deforms slightly and cushions the rods.

Step 4 – remove the dentine, as at X: The rods at **X** now end on nothing. Load applied to them is not passed to dentine, so it is resolved as a shearing force in the interrod region.

Step 5 – state what follows: That enamel is **unsupported enamel**. It fractures under occlusal load, or in the first weeks of function, leaving a marginal ditch, a leaky interface, marginal staining and recurrent caries.

Step 6 – state the preparation rule: Unsupported enamel at a cavosurface margin must be removed, or the margin planed and beveled, so that the rods at the

finished margin still rest on sound dentine and are directed outwards towards the surface. This is exactly why the cavosurface angle of an amalgam preparation is kept at about 90 degrees with full dentine support, and why enamel margins in the axial walls are finished along, not across, the rod direction.

Why the other options are wrong:

- B, rods parallel to the dentinoenamel junction: reverses the anatomy. Rods run **across** enamel from the junction to the surface, roughly perpendicular to the junction. Enamel takes its support from the dentine below, not from its own surface.
- C, support from the enamel cuticle: is not credible. The enamel cuticle, Nasmyth's membrane, is a submicroscopic organic film on the erupted surface. It contributes no mechanical support at all and is lost to mastication and brushing within weeks of eruption.
- D, re-supported by new enamel: is impossible. Ameloblasts are lost when the tooth erupts, so no new enamel can ever be formed. Enamel can remineralise existing crystals, but it can never add fresh matrix beneath an undermined ledge.

Final Answer: Rods run perpendicular to the dentinoenamel junction; unsupported enamel at **X** must go $\Rightarrow$ A

Answer: (A) Go Back to Q8

Q9.

Solution

Concept – dentine is a permeable tissue, and the bur changes its permeability: Dentine permeability depends on how many tubules are open and how wide they are, and the smear layer acts directly on both.

Step 1 – recall what governs permeability: Dentine is permeable through its **tubules**. Near the pulp the tubules are more numerous, about 45,000 per square millimetre, and wider, about 2.5 micrometres. Near the dentinoenamel junction they are fewer, about 20,000 per square millimetre, and narrower, about 0.8 micrometres. Deep dentine is therefore far more permeable than superficial dentine.

Step 2 – see what the bur does: A rotating bur or a hand instrument does not cut dentine cleanly. It grinds and smears the surface, and the frictional heat and pressure plaster the debris across it.

Step 3 – describe the layer formed: The result is the **smear layer**, roughly **1 to 5 micrometres** thick. It is made of cut hydroxyapatite crystallites, denatured

collagen, odontoblast process fragments, saliva and, in a carious tooth, bacteria.

Step 4 – follow it into the tubules: Tags of the same debris are forced a few micrometres into the tubule orifices as **smear plugs**.

Step 5 – state the effect on permeability: Because the orifices are plugged, the smear layer **reduces** dentine permeability sharply, by around 85 to 90 percent. It is a natural, if imperfect, barrier to fluid movement and to bacterial ingress.

Step 6 – draw the restorative conclusion: For adhesive dentistry the layer must be dealt with, because it is loose, weakly attached debris and no bond built onto it can be stronger than its own attachment to the dentine below. Total-etch systems **remove** it with 37 percent phosphoric acid, opening the tubules and exposing the collagen network for hybrid layer formation. Self-etch systems **dissolve and incorporate** it instead. Either way, the smear layer is removed or modified, never simply bonded to.

Why the other options are wrong:

- A, reparative dentine within minutes: confuses two entirely different things. Reparative dentine is laid down by pulpal cells over weeks and months, from the pulpal side. The smear layer is inert cut debris on the outer surface, formed instantly by the bur.
- C, sterile and unremovable by acid: is wrong twice. The smear layer of a carious cavity routinely contains **bacteria**, and 37 percent phosphoric acid removes it completely in 15 seconds. If it truly could not be removed, total-etch bonding could not work at all.
- D, increases permeability by opening the tubules: is the exact reverse. The layer **plugs** the orifices and cuts permeability by roughly an order of magnitude. It is when the smear layer is removed by etching that permeability rises and post-operative sensitivity becomes a risk.

Final Answer: A 1 to 5 micrometre debris layer that plugs tubules, lowers permeability, and must be removed or modified for bonding $\Rightarrow$ B

Answer: (B) Go Back to Q9

Q10.

Solution

Concept – the pulp is layered, and the layers are read from the dentine inwards: The coronal pulp shows four histological zones in a fixed order, and each is defined by its cell population.

Step 1 – zone 1, immediately under the dentine: The **odontoblast layer**. A palisade of odontoblast cell bodies pressed against the predentine, three to five cells deep in the crown, with their processes running out into the dentinal tubules. Capillaries and unmyelinated nerve fibres run between the cells.

Step 2 – zone 2, just inside it: The **cell-free zone of Weil**, about 40 micrometres wide. It looks empty of cell bodies, but it is not empty of structure. It contains the capillary plexus and the plexus of Raschkow, the subodontoblastic nerve plexus. It is best seen in the coronal pulp and it is absent, or disappears, where dentine is actively being laid down.

Step 3 – zone 3, deeper still: The **cell-rich zone**, densely populated with fibroblasts and undifferentiated ectomesenchymal cells. This is the reserve. When odontoblasts die under a deep cavity, cells from here migrate outwards and differentiate into the odontoblast-like cells that form reparative dentine.

Step 4 – zone 4, the centre: The **pulp core**, or pulp proper. Loose connective tissue with fibroblasts, the main vessels and nerve trunks, collagen fibres and ground substance.

Step 5 – assemble the order: Working inwards from the dentine, the order is odontoblast layer, cell-free zone of Weil, cell-rich zone, pulp core. That is option C, and it matches bands 1, 2, 3 and 4 of the diagram.

Step 6 – fix it with a memory hook: Cells first, then no cells, then many cells, then the core. Notice the logic: the cell-free zone is a traffic corridor for the nerve and vascular plexuses supplying the odontoblasts, so it lies between the odontoblasts and their reserve pool.

Why the other options are wrong:

- A, the cell-free zone placed outermost: is anatomically impossible. Nothing lies between the odontoblasts and the predentine, because the odontoblasts are the cells that make the predentine. This option also puts the pulp core before the cell-rich zone, which reverses the two innermost layers.
- B, the cell-rich zone before the cell-free zone: swaps zones 2 and 3. It is a tempting order because the cell-rich zone sounds like the natural neighbour of the odontoblast layer, but the cell-free zone of Weil separates them.
- D, the full sequence reversed: reads the pulp from the centre outwards instead of from the dentine inwards, and the question explicitly specifies the direction.

Final Answer: Odontoblast layer, cell-free zone of Weil, cell-rich zone, pulp core $\Rightarrow$ C

Answer: (C) Go Back to Q10

Q11.

Solution

Concept – the periodontal ligament knows which tooth it is; the pulp does not: Localisation needs proprioception, and only one of these two tissues has it.

Step 1 – take the blood supply of the ligament: The periodontal ligament is **unusually vascular** for a ligament. It receives three sets of vessels: apical vessels entering with the pulpal supply from the superior and inferior alveolar arteries, perforating vessels passing through the cribriform plate of the alveolar bone, and gingival vessels entering from the coronal end. They anastomose into a rich plexus that lies nearer the bone than the cementum.

Step 2 – say why that vascularity matters: The plexus lets the ligament act as a hydraulic cushion that damps sudden occlusal load, and it supports the very high turnover of the ligament, the highest of any connective tissue in the body.

Step 3 – take the nerve supply of the ligament: Sensory fibres come from the dental branches of the **trigeminal nerve**, entering through the apex and through the alveolar bone. Four ending types are described: free nerve endings for pain, Ruffini-like mechanoreceptors chiefly at the apex, coiled Meissner-like endings in the mid-root region, and encapsulated spindle-like endings apically.

Step 4 – state the key property: The mechanoreceptors are **proprioceptive**. They report the direction and the magnitude of a force, and each receptive field belongs to one tooth. So light pressure on one tooth produces a signal that identifies that tooth. Thresholds are low; a load of a few grams is enough.

Step 5 – contrast the pulp: The pulp is innervated only by **free nerve endings**, A-delta fibres for the sharp fast pain and C fibres for the dull throbbing pain. It has **no proprioceptors and no mechanoreceptors**. Every stimulus, heat, cold, pressure, chemical, is felt as one sensation, pain.

Step 6 – explain the clinical picture in the stem: Pulpal pain is therefore poorly localised, and it commonly refers across the midline or between arches within the same trigeminal division, so the patient genuinely cannot name the tooth. The moment inflammation extends beyond the apex into the periodontal ligament, the proprioceptive endings are involved, and tenderness to percussion becomes exquisitely localised. This is precisely why the percussion test tells you which tooth to open, and why pain on biting is the sign that apical periodontitis has begun.

Step 7 – add the protective role: The same receptors drive the jaw-opening reflex that stops the mandible when you bite unexpectedly on a stone, which is why an implant, having no periodontal ligament, gives so much poorer tactile discrimination.

Why the other options are wrong:

- A, pulpal proprioceptors switched off by inflammation: invents receptors that do not exist. The pulp has no proprioceptive endings in health either, so there is nothing for inflammation to switch off.
- B, pulpal pain precisely localised: states the reverse of clinical reality. Pulpal pain is the classic poorly localised, referring toothache, which is exactly why the stem's patient cannot name the tooth.
- C, the ligament avascular and aneural: is contradicted on both counts. It is one of the most richly vascular and richly innervated connective tissues in the body, and alveolar bone has nothing like the receptor density needed for single-tooth discrimination.

Final Answer: A vascular, proprioceptively innervated ligament localises; a pulp with only free nerve endings does not $\Rightarrow$ D

Answer: (D) Go Back to Q11

Q12.

Solution

Concept – cementum is deposited for life and is essentially not resorbed: Deposition without physiological resorption can only mean one thing, a tissue that keeps getting thicker.

Step 1 – state the deposition: Cementoblasts survive in the periodontal ligament throughout life and continue to lay down cementum in slow, incremental layers.

Step 2 – state the absence of remodelling: Unlike bone, cementum is **not physiologically remodelled**. There is no coupled resorption phase to balance the deposition.

Step 3 – put the two together: Continued deposition with no matching resorption means the thickness can only rise. It **increases with age**.

Step 4 – give the figures: Cervical cementum is thin, roughly 20 to 50 micrometres. Apical cementum is much thicker, roughly 150 to 200 micrometres. Overall, thickness rises about **threefold** between about 16 years and about 70 years of age.

Step 5 – locate the greatest gain: The gain is greatest in the **apical** region and in the furcation. Those are the sites of the cellular cementum that is laid down rapidly enough to trap its own cells.

Step 6 – explain why the apex: Apical deposition compensates for occlusal attrition of the crown, allowing continued passive eruption so the vertical dimension

is maintained. It also shortens the apical foramen and makes it narrower and more irregular with age, which is why root canal treatment in an elderly patient is harder and why apical constriction is difficult to locate.

Step 7 – note the pathological extreme: Excessive deposition gives **hypercementosis**, seen with chronic periapical inflammation, occlusal trauma, Paget's disease and acromegaly, which is the same process pushed too far.

Why the other options are wrong:

- A, fixed at eruption and only falling: is false. Cementum deposition continues for as long as the tooth is functional, and it is the very reason cementum thickness is one of the age estimation methods in forensic odontology.
- C, continuously remodelled like bone: is the classic trap. Bone remodels, cementum does not. That absence of remodelling is exactly why orthodontic force resorbs alveolar bone readily while cementum is comparatively resistant, and why cementum accumulates rather than turns over.
- D, thickest gain cervically: reverses the regional pattern. The cervical third carries thin acellular cementum, and it is the apical third and furcation that thicken most.

Final Answer: Lifelong deposition, thickness roughly trebling with age, greatest apically $\Rightarrow$ B

Answer: (B) Go Back to Q12

Q13.

Solution

Concept – sebaceous glands where they do not belong, and no harm done: The biopsy in the stem names the lesion outright; the task is to recognise that this is a normal variant.

Step 1 – read the histology: Lobules of **sebaceous glands** lying in the lamina propria of the oral mucosa, with **no hair follicle** attached. Sebaceous glands normally exist only in skin, and normally in association with a hair follicle.

Step 2 – name them: Sebaceous glands in the oral mucosa without a hair follicle are **Fordyce granules**, that is, ectopic sebaceous glands.

Step 3 – match the clinical picture: Small yellowish-white granular spots, often in clusters or plaques, on the **buccal mucosa opposite the molars** and on the vermilion of the upper lip. They do not rub off, they are asymptomatic and they have been present for years. That is Fordyce granules exactly.

Step 4 – add the natural history: They are extremely common, reported in 70 to 80 percent of adults. They are usually invisible in children, become apparent around puberty under androgenic drive and increase with age. Their ducts open onto the mucosal surface and the sebum they produce is harmless.

Step 5 – explain how they arise: The buccal mucosa develops from ectoderm of the stomodeum, the same tissue that gives rise to skin, so sebaceous differentiation there is a developmental variant, not a disease.

Step 6 – state the management: No treatment. **Reassurance** only. Because they are a normal variant, biopsy is not usually needed either, and knowing them saves the patient an unnecessary procedure.

Why the other options are wrong:

- A, pseudomembranous candidiasis: fails on almost every count. Its white plaques **rub off** leaving an erythematous base, it develops over days rather than years, and its histology shows hyphae on PAS staining, not sebaceous lobules.
- C, homogeneous leukoplakia: is a white **plaque**, not discrete yellowish granules, and its histology shows hyperkeratosis with or without dysplasia. There is no sebaceous tissue in it.
- D, ectopic sebaceous tissue that is premalignant: gets the tissue right and the meaning wrong. Fordyce granules carry **no malignant potential**. Excision would be surgery performed on a normal anatomical variant found in most of the adult population.

Final Answer: Fordyce granules, a normal variant needing reassurance only $\Rightarrow$ B

Answer: (B) Go Back to Q13

Q14.

Solution

Concept – saliva is made in the acinus and then rewritten on its way out: The duct system is not a passive pipe. One of its segments changes the electrolyte content of saliva completely.

Step 1 – start at the acinus: The acinus, serous or mucous, secretes the **primary saliva**. It is **isotonic** with plasma and it contains the amylase, mucins and other proteins.

Step 2 – the first duct segment: The **intercalated duct**. It is short and narrow,

and it is lined by low cuboidal cells. It carries the primary saliva away from the acinus and adds a little bicarbonate and lysozyme. Myoepithelial cells lie around the acini and the intercalated duct, and their contraction expels the saliva.

Step 3 – the second duct segment: The **striated duct**, an intralobular duct lined by tall **columnar** cells. Its basal membrane is deeply infolded, and mitochondria are packed in vertical rows between the infoldings. Those mitochondria, aligned in the folds, are what create the striated appearance under the light microscope and give the duct its name. That is the description marked **X** in the stem, so **X** is the striated duct.

Step 4 – say what the striated duct does: The infoldings and the mitochondria are the machinery of active transport. The striated duct **reabsorbs sodium and chloride** and **secretes potassium and bicarbonate**.

Step 5 – explain the result: The duct removes more solute than water, and the duct epithelium is relatively **impermeable to water**, so water does not follow. The saliva that leaves is therefore **hypotonic**, rich in potassium and low in sodium. This is why the striated duct is the segment that modifies electrolyte content, and why it is best developed in the parotid, the most serous gland.

Step 6 – the last segment: The **excretory duct**, which runs interlobularly and then out of the gland. It grows from pseudostratified columnar to stratified squamous as it nears the oral orifice, and it is essentially a conduit.

Step 7 – assemble the chain: Acinus, intercalated duct, striated duct, excretory duct, with **X** as the striated duct. That is option C, and it matches the diagram, in which the tube widens at each successive segment.

Why the other options are wrong:

- A, striated duct before the intercalated duct: swaps the two intralobular ducts and then mislabels **X** as the intercalated duct. The intercalated duct is low cuboidal with few mitochondria, so the histological description in the stem cannot fit it.
- B, excretory duct before the striated duct: puts the extralobular conduit in the middle of the intralobular chain, which is anatomically impossible, and it names the excretory duct as **X**. The excretory duct only conducts saliva, and its stratified lining does no active transport.
- D, excretory duct straight off the acinus: reverses the whole chain, running from the largest duct to the smallest. It happens to name **X** as the striated duct, but the sequence is wrong, and the question asks for both to be correct.

Final Answer: Acinus, intercalated, striated, excretory, with **X** the striated duct $\Rightarrow$ C

Answer: (C) Go Back to Q14

Answer Key

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