Section A

1 Theory, MCQs and Answers

1. Orientation to Dental Sciences

Dentistry is an art of science and clinical skill of applications of recent innovations in science and technologies for preventions, corrections and treatments of health problems of various dental and associated soft and hard tissues, as well as providing desired treatments, permanent oral appliances, many of these being fabricated outside the oral cavity.

1-1. The overriding goal of dentistry is to:

(a) Maintain or improve the dental health of the patient
(b) Maintain or improve the clinical skill of the dentist
(c) Alleviate pain
(d) Professional gains

1-2. Father of modern dentistry is:

(a) Dr John Greenwood (Jr.)
(b) Pierre Fauchard
(c) Phillips Skinner
(d) Dr R Ahmed

1-3. Purpose of studying science of dental materials is to:

(a) Understand their properties
(b) Economise cost of the treatment
(c) Select the best and most appropriate materials
(d) Manipulate materials quickly

1-4. Dental materials are classified for:

(a) Arranging them systematically
(b) Avoiding spurious materials
(c) Informing the patients the cost of treatment
(d) Selection of most suitable materials quickly

32. Resin modified ZnOE (brand name Kalginol/IRM) dispensed as powder liquid.

Table 2.4.2: Compositions

Powder	*Wt%*	*Functions*
Zinc oxide	70	Reactive ingredients
Natural or synthetic resins (PMMA)	30	Increases strength
Liquid	*%*	*Functions*
Eugenol	85%	Reactor
Acetic acid	15%	Accelerators
Thymol	Small amount	Antimicrobial (cement)

Setting reaction: Same as ZnOE and has higher compressive strength = 55 MPa.

Uses

- Permanent cementation
- Cavity lining agents and base
- Intermediate restorative material (IRM)
- Restoration of deciduous teeth
- Temporary restoration

(*Note:* IRM—intermediate restorative material and as a base)

Intermediate restoration—should last for a few weeks to months

Specialities: Same as ZnOE**.**

33. Alumina reinforced EBA (ortho-ethoxybenzoic acid) cement—dispensed in powder liquid system

Uses

- Permanent cementations
- Cavity liners and bases
- Intermediate restorations

Drawbacks

- Exhibits shrinkage on setting.
- Biocompatibility is not very good.
- Susceptible to dehydration, absorbs water, produces significant dimensional changes.

Uses

- Liner under composite resins
- Core build up material
- Fissure sealant
- Cement base material
- Cementation of orthodontic bands

44. Compomer-resin modified tri cure GIC

Dispensed in disposable single paste capsule/syringe systems (or rarely powder liquid).

Composition: Non-reactive organic fillers, reactive glass particles with NaF, polyacid modified monomers and photo-activators.

Setting reactions: Initially, chemical cure (polymerization) and slow acid–base reaction of GIC, then by photoinitiation.

Properties and uses—similar to resin modified GIC (*refer* Q. 43).

45. Vitremer—core build up GIC restorative material Fuji VII glass-ionomer cement

Speciality and use

- World's first high fluoride, non-resin containing—auto cure-glass ionomer cement.
- Excellent material for prevention of caries and used for molar restorations in deciduous teeth and used as core build up material.

46. Cavity varnishes

Compositions: Natural gums (copal resin or rosins, synthetic resins-nitrated cellulose) dissolved in organic solvents like acetone, chloroform or ether and sometimes provided separately.

spherical particles are prepared. These are kept at 100°C for 24 hours (functions of these are same as in Table 2–23).

Amlgamation reaction:

$$Ag\text{-}Sn(\beta) + Ag_3Sn(\gamma) + Cu_3\,Sn + Hg \rightarrow Ag_3Hg_2(\gamma_1) + \eta$$
$$(Cu_6Sn_5) + \text{unreacted-}\beta + \gamma + Cu_3\,Sn + Hg$$

Microstructure: The ***prismatic phase crystals grow interconnecting and intermeshing with γ_1 crystals*** and bind unreacted particles. Due to this, it has

- **Low** Hg/Alloy ratio = 45–50%.
- **High 1 hr compressive strength** = 260–270 MPa, and restoration can be completed in single sitting.
- **Higher maximum** strength = 510 MPa,
- **Higher** TS**:** 65–70 MPa (24 hours)
- **Lowest creep:** 0.05–0.1%.

59. Copper amalgam (anti bacterial), dispensed as pellets containing Hg (out dated)

Compositions: Cu = 30–40% and Hg = 60–70%.

Manipulation: These pellets are heated in steel spatula (scoop) until the mercury droplets come out to the surface, triturated and condensed into the cavity. Earlier, used for deciduous teeth in rampant caries due to antibacterial effect of copper. But nowadays not used due to low corrosion resistance, poor mechanical properties and large excess of Hg.

60. Gallium alloys

Gallium (density = 5.9 gm/cc and melting at 29.8°C) replaces Hg.

Compositions

Powder has Ag = 50%, Sn = 25%, Cu = 15%, Pd = 9%, etc.

Liquid has Ga = 65% and, In, Sn, etc., which depress melting temperature of Ga. On trituration, the Ga alloys formed bind the unreacted powder particles. Ga is more cytotoxic, cause adverse effects on pulp and mix becomes too thin and difficult to condense.