ZENITH EDUCATION

MP Assistant Professor Chemistry — Paper II — B-Series MCQ Bank

Units 2–9 and most of Unit 10: questions reused from our earlier verified banks, kept complete (stem, four options, key, explanation).

Unit 1 and the Madhya Pradesh section of Unit 10: newly written from the new notes (not independently key-checked).

Table 0.1: Navigation: questions per unit

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Unit 1: Ancient Indian Chemistry and Rasashastra

Q1. In Rasashastra, which aim is called Dehavada or Rasayana?

(A) Extraction of zinc by distillation

(B) Use of processed minerals in Ayurvedic pharmacy

(C) Transmutation of base metals into gold

(D) Preparation of dyes and pigments

Answer: B. Dehavada/Rasayana is the second stated aim, the use of processed minerals in Ayurvedic pharmacy. The first aim, Dhatuvada or Lohavada, was transmutation of base metals into gold.

Q2. The Rasashastra aim of Dhatuvada (Lohavada) refers to

(A) rejuvenation therapy using herbs

(B) transmutation of base metals into gold

(C) fermentation of asava and arishta

(D) preparation of perfumes

Answer: B. Dhatuvada or Lohavada was the transmutation of base metals into gold. The other aim, Dehavada, concerned pharmacy.

Q3. Which period of Indian chemistry is associated with the Tantric-Siddha movement and works such as Rasahridaya Tantra and Rasarnava?

(A) Atomic and philosophical period

(B) Rasa period (c. 7th-14th century CE)

(C) Indus Valley period

(D) Modern recovery period

Answer: B. The Rasa period (c. 7th-14th century CE) saw the rise of Rasashastra with the Tantric-Siddha movement. Key works include Rasahridaya Tantra, Rasaratnakara and Rasarnava.

Q4. Which text, dated c. 3rd century BCE to 3rd century CE, gives detailed notes on mines, metals, alloys, mint, salt, alkali, liquor and dyes?

(A) Vaisheshika Sutra

(B) Kautilya's Arthashastra

(C) Rasaratna Samuchchaya

(D) Ashtanga Hridaya

Answer: B. Kautilya's Arthashastra is placed in the atomic and philosophical period and covers mines, metals, alloys, mint, salt, alkali, liquor and dyes.

Q5. Vajralepa, a very durable adhesive recipe, is described in the

(A) Vaisheshika Sutra

(B) Brihat Samhita of Varahamihira

(C) Charaka Samhita

(D) Rasendra Chudamani

Answer: B. Varahamihira's Brihat Samhita (6th century) gives perfumery and cement (vajralepa) recipes. It is made from boiled mixtures of lime, resin, jaggery and myrobalan.

Q6. P. C. Ray's A History of Hindu Chemistry was published in two volumes in

(A) 1888 and 1896

(B) 1902 and 1908

(C) 1912 and 1914

(D) 1924 and 1932

Answer: B. Volume I appeared in 1902 and Volume II in 1908. It was compiled from Sanskrit manuscripts and brought the heritage to modern chemists.

Q7. In the Rasashala, the class of equipment called Puta refers to

(A) furnaces

(B) graded fires used for incineration

(C) bellows

(D) clay crucibles

Answer: B. Puta is the heating system of graded fires used for incineration. Crucibles are Musha and furnaces are Kosthi.

Q8. Which puta uses a large pit with about 1000 dung cakes?

(A) Lavakaputa

(B) Gajaputa

(C) Kapotaputa

(D) Kukkutaputa

Answer: B. Gajaputa is the large pit puta with about 1000 dung cakes. Mahaputa is described as the strongest.

Q9. Temperature control in the Rasashala was achieved by

(A) thermometers of mercury

(B) the type of fire (mridu, madhya, tikshna agni)

(C) thermocouples of copper

(D) pyrometric cones

Answer: B. Temperature was controlled by the type of fire rather than by instrument. The grades were mridu (mild), madhya (medium) and tikshna (strong).

Q10. A Yantra in Rasashastra is defined as an instrument that carries out a chemical operation by means of

(A) a given pressure and catalyst

(B) a given heat and medium

(C) a given solvent and acid

(D) a given light and mantra

Answer: B. The notes define a Yantra as an instrument serving a chemical operation by means of a given heat and medium.

Q11. The Khalva yantra was used mainly for

(A) sublimation of sulphur

(B) trituration of mercury with sulphur

(C) extraction of zinc

(D) steam heating of herbs

Answer: B. Khalva yantra is a mortar of stone or iron used for trituration of mercury with sulphur.

Q12. In Dola Yantra, the material to be treated is

(A) heated in a sealed hourglass-shaped vessel

(B) tied in a cloth bundle and suspended in a boiling liquid medium

(C) pounded with a lever

(D) placed in a sand-filled pot

Answer: B. In Dola Yantra a pottali is hung from a rod so that it dips in the liquid without touching the bottom. The process is hot extraction or digestion.

Q13. The distinction between Dola and Swedana Yantra is that in Swedana

(A) the material is sublimed on a cooled lid

(B) the material is held in the vapour zone and does not touch the boiling liquid

(C) the material is immersed in the liquid

(D) the material is heated in a sand bath

Answer: B. In Swedana the bundle rests in the vapour zone (steam heating, about 100 degrees Celsius). In Dola the bundle is immersed in the liquid.

Q14. Dola Yantra is chiefly used for

(A) extraction of mercury from cinnabar

(B) shodhana of minerals such as sulphides and arsenicals

(C) fumigation of vessels

(D) preparation of Rasasindura

Answer: B. Dola Yantra is used for shodhana (purification) of minerals, especially sulphides and arsenicals, and herbal drugs.

Q15. Haritala (orpiment) is chemically

(A) HgS

(B) As2S3

(C) As4S4

(D) Sb2S3

Answer: B. Haritala is orpiment, As2S3. Manahshila is realgar, As4S4.

Q16. Kanji, the sour gruel used in Dola Yantra, owes its acidity mainly to

(A) hydrochloric acid

(B) dilute lactic and acetic acid formed by fermentation

(C) tartaric acid from grapes

(D) citric acid from lemons

Answer: B. Kanji is a fermented sour rice gruel containing mainly dilute lactic and acetic acid.

Q17. Swedana Yantra operates at a temperature limited to about

(A) 300 degrees Celsius

(B) 100 degrees Celsius

(C) 1000 degrees Celsius

(D) 600 degrees Celsius

Answer: B. Swedana is steam heating and is limited to about 100 degrees Celsius, giving mild and uniform heating.

Q18. The word Patana in Rasashastra denotes

(A) calcination

(B) sublimation and distillation

(C) fermentation

(D) fumigation

Answer: B. Patana literally means causing to fall or fly and is the term for sublimation and distillation.

Q19. Patana is classified into three types on the basis of

(A) the metal being treated

(B) the direction of travel of vapour relative to the heated vessel

(C) the type of fuel

(D) the duration of heating

Answer: B. Urdhva (upward), Adhah (downward) and Tiryak (sideways) Patana are distinguished by vapour direction.

Q20. In Urdhva Patana Yantra, the sublimate is collected

(A) in a receiver set into the ground

(B) on the cooled upper inverted pot

(C) in a bent tube

(D) in a sand bath

Answer: B. Two pots are joined mouth to mouth, the lower is heated and the upper kept cool, so vapours condense there as a solid sublimate.

Q21. The joint of the pots in Urdhva Patana and Damru yantras is sealed with

(A) lime putty only

(B) clay-smeared cloth in seven coats

(C) molten lead

(D) wax and resin

Answer: B. The joint is sealed with mrittika-vastra, clay-smeared cloth in seven coats, then dried.

Q22. Which yantra is the classical method for extraction of mercury from cinnabar and for distilling oils, with the heat source on top?

(A) Urdhva Patana

(B) Adhah Patana

(C) Dola

(D) Dhup

Answer: B. In Adhah Patana the upper pot is heated and liquid or volatile components distil downward into a cooler receiver. This suits mercury and oils.

Q23. The principle of the Zawar zinc retort process corresponds to

(A) Urdhva Patana

(B) Adhah Patana

(C) Swedana

(D) Baluka

Answer: B. The Zawar retorts were arranged upside down with downward receiver pipes, a downward distillation per descensum corresponding to Adhah Patana.

Q24. Tiryak Patana differs from Adhah Patana in that the vapour

(A) rises and condenses on the upper pot

(B) moves through an inclined sideways tube to a cooled receiver

(C) travels straight down by gravity

(D) is not condensed at all

Answer: B. Tiryak Patana uses a pipe leading sideways at an angle to a receiver kept cool in water. It is described as the ancestor of the retort and receiver.

Q25. Kosthi in Rasashastra means

(A) furnace or chamber

(B) crucible

(C) fumigation pot

(D) sand pot

Answer: A. Kosthi is a brick or earthen furnace with a bellows air-hole. The crucible is Musha.

Q26. Which of the following is a type of Kosthi described in the notes?

(A) Gostani Kosthi

(B) Patala Kosthi (pit furnace)

(C) Vrintaka Kosthi

(D) Kapota Kosthi

Answer: B. Angara, Patala, Garbha and Bhumi Kosthi are listed. Gostani and Vrintaka are crucible (musha) types and Kapota is a puta.

Q27. Satvapatana of mica (abhraka) in a Kosthi involves heating it with

(A) only water

(B) mercury and sulphur only

(C) sour medium, borax and oils

(D) lime and brick dust

Answer: C. Satvapatana is extraction of a metal-like essence. For mica it uses sour medium, borax and oils in a Kosthi.

Q28. The Vidyadhara Yantra is best described as

(A) a fumigation vessel

(B) a mouth-to-mouth sublimation apparatus with water in the upper pot

(C) a sand bath for flasks

(D) a lever pounder

Answer: B. The lower pot holds material and a smaller upper pot with water as cooling agent rests in its mouth. Sublimate deposits

under the upper vessel.

Q29. Dheki (Dhenki) Yantra in its first sense is

(A) a lever-based pounding and grinding device

(B) a sand bath

(C) a steaming vessel

(D) a tortoise-shaped cover

Answer: A. Dheki is named after the foot-operated lever pounder. Some texts describe a bent-tube distillation apparatus instead.

Q30. In Baluka Yantra the flask is

(A) suspended in boiling liquid

(B) sealed with seven layers of clay-smeared cloth and placed in a pot of fine sand

(C) inverted over a receiver in the ground

(D) heated directly over charcoal

Answer: B. Baluka (sand) Yantra is a sand bath. The Kupi is wrapped in seven layers of clay-cloth and heated with graded fire.

Q31. Kupipakva Rasayana preparations such as Rasasindura and Makaradhvaja are made using

(A) Dheki Yantra

(B) Baluka Yantra

(C) Dola Yantra

(D) Dhup Yantra

Answer: B. Kupipakva is the central process of Baluka Yantra, which provides slow even heat.

Q32. Rasasindura is essentially

(A) black mercuric sulphide

(B) red mercuric sulphide

(C) red lead

(D) mercurous chloride

Answer: B. Black kajjali on heating sublimes and deposits on the cool neck as red crystalline HgS, which is Rasasindura.

Q33. Kajjali, the product of grinding mercury with sulphur, is

(A) red HgS

(B) black amorphous HgS

(C) $Hg_2(NO_3)_2$

(D) $HgCl_2$

Answer: B. Hg + S gives black sulphide (metacinnabar or amorphous) called Kajjali. It converts to red HgS on sublimation.

Q34. Why is sand used in Baluka Yantra?

(A) It reacts with mercury

(B) It is a poor conductor and good heat reservoir, giving slow even heating

(C) It absorbs sulphur dioxide

(D) It cools the flask quickly

Answer: B. Sand delivers heat slowly and evenly, avoiding cracking of glass and local overheating.

Q35. The name Kachchap Yantra refers to its

(A) hourglass shape

(B) use of sand

(C) tortoise-shaped profile

(D) lever action

Answer: C. Kachchap means tortoise. A shallow pot is covered by a domed vessel giving a tortoise-back profile.

Q36. Dhup Yantra is used for

(A) sublimation of ammonium chloride

(B) fumigation (dhupana)

(C) pounding minerals

(D) sand-bath heating

Answer: B. Dhup Yantra burns drug powders, resins or sulphur for fumigation of vessels and materials. Burning sulphur gives SO_2.

Q37. The Damru (Damaru) Yantra consists of

(A) a sand-filled pot with flask

(B) two narrow-mouthed earthen pots joined mouth to mouth giving an hourglass shape

(C) a pot with a perforated base over a receiver

(D) a lever and pestle

Answer: B. The Damaru is the hourglass drum of Shiva. The lower pot is heated and the upper is kept cool, as in Urdhva Patana.

Q38. Which pair of yantras are both mouth-to-mouth sublimation devices?

(A) Dola and Swedana

(B) Vidyadhara and Damru

(C) Baluka and Kosthi

(D) Dhup and Dheki

Answer: B. Damaru and Vidyadhara are both mouth-to-mouth sublimation devices, with overlapping descriptions.

Q39. Which compound is classically sublimed in the Damru Yantra, recombining on the cool upper pot?

(A) Copper sulphate

(B) Ammonium chloride (navasadara)

(C) Calcium carbonate

(D) Cinnabar

Answer: B. NH4Cl decomposes to NH3 and HCl in the lower pot and recombines on the cool upper surface.

Q40. Which of the following is a Kosthi-type smelting example given in the notes?

(A) HgS + O2 giving Hg + SO2 in a sand bath

(B) SnO2 + 2C giving Sn + 2CO

(C) NH4Cl sublimation

(D) Sulphur fumigation

Answer: B. Cassiterite is smelted with charcoal in a crucible in a Kosthi.

Q41. Evidence of ancient mining of zinc, lead and silver exists at

(A) Hazaribagh

(B) Zawar

(C) Khetri

(D) Kolar

Answer: B. Zawar (Rajasthan) shows zinc, lead and silver workings. Khetri and Singhbhum are copper, Kolar and Hutti gold, Hazaribagh and Bastar iron.

Q42. Fire-setting in ancient mining involved

(A) blasting with gunpowder

(B) panning in rivers

(C) dissolving ore in acid

(D) heating rock and quenching with water to crack it

Answer: D. Fire-setting is heating rock and quenching with water to crack it.

Q43. Cupellation was used for refining

(A) zinc

(B) silver and gold

(C) iron

(D) tin

Answer: B. Cupellation refines silver and gold. Liquation removes lead from copper and forge welding refines wrought iron.

Q44. The Panchaloha alloy used for idols consists of

(A) copper, zinc, tin, lead and mercury

(B) gold, mercury, iron, zinc and tin

(C) silver, brass, bronze, iron and lead

(D) gold, silver, copper, tin or lead, and iron

Answer: D. Panchaloha is a five-metal alloy of gold, silver, copper, tin or lead and iron.

Q45. Bell metal contains copper with about what percentage of tin?

(A) 20 percent

(B) 2 percent

(C) 50 percent

(D) 80 percent

Answer: A. Bell metal is copper with higher tin, about 20 percent. Tools bronze has about 5-12 percent Sn.

Q46. The bronze Dancing Girl of Mohenjo-daro illustrates

(A) amalgam gilding

(B) fire-setting

(C) cupellation

(D) lost-wax (cire perdue) casting

Answer: D. The Harappan dancing girl (c. 2500 BCE) shows lost-wax casting, whose continuity is seen in Chola bronzes.

Q47. Bidri ware is made from

(A) pure silver with enamel

(B) a zinc-rich alloy blackened with copper sulphate and ammonium-chloride-rich soil

(C) bronze with lacquer

(D) wrought iron coated with lac

Answer: B. Bidri uses a zinc-rich alloy, blackened with copper sulphate solution and soil rich in ammonium chloride, from the Bahmani period.

Q48. Indigo dyeing is described as a vat dye because

(A) it is fixed by iron salts

(B) the insoluble indigo is reduced to soluble leuco-indigo in an alkaline fermenting vat and re-oxidised in air

(C) it is extracted from an insect

(D) it needs an alum mordant

Answer: B. Leuco-indigo (indigo white) in the vat is oxidised back to indigo on exposure to air. No mordant is needed.

Q49. The precursor glucoside in the leaves of Indigofera tinctoria is

(A) alizarin

(B) curcumin

(C) carthamin

(D) indican

Answer: D. Fermentation hydrolyses indican to indoxyl, which oxidises to insoluble indigotin.

Q50. Madder (manjistha) dyes depend on which class of chemical and mordant?

(A) Naphthoquinone fixed by lime

(B) Carotenoids fixed by tannin

(C) Indigoids fixed without mordant

(D) Anthraquinones (alizarin, purpurin) fixed with alum or other metal mordants

Answer: D. Rubia cordifolia gives alizarin-type anthraquinone dyes. Alum gives a red lake and iron gives purple-brown.

Q51. Kumkum gets its red colour because

(A) mercury is added

(B) curcumin in turmeric turns red in alkali (lime)

(C) madder is used

(D) lac dye is added

Answer: B. Turmeric with lime changes colour by pH change, as curcumin is red in alkali.

Q52. Henna's colouring principle is

(A) laccaic acid

(B) lawsone (2-hydroxy-1,4-naphthoquinone)

(C) indican

(D) carthamin

Answer: B. Lawsonia inermis contains lawsone. Laccaic acids come from lac.

Q53. Laccifer lacca provides

(A) indigotin

(B) alizarin

(C) curcumin

(D) laccaic acid dye and shellac resin

Answer: D. Lac insect secretion gives red laccaic acids and shellac resin for sealing and varnish.

Q54. Iron-tannate black on cloth is obtained from

(A) madder and alum

(B) indigo and lime

(C) iron salts or scrap with jaggery water and myrobalan tannin

(D) lamp black and lac

Answer: C. Iron(II) sulphate or scrap in jaggery water with myrobalan tannin forms iron-tannate black.

Q55. In the pigment table, red lead (sindura) has the formula

(A) HgS

(B) Pb3O4

(C) Fe2O3

(D) PbO

Answer: B. Red lead is Pb3O4, vermilion is HgS and red ochre is Fe2O3.

Q56. Ajanta paintings are described in the notes as

(A) true fresco on wet lime

(B) oil paintings

(C) encaustic

(D) mostly tempera on dry plaster, not true fresco

Answer: D. The notes state that the claim of true fresco is not accepted and give tempera type on dry plaster.

Q57. Which pigment is orpiment (haritala), yellow in colour?

(A) Sb2S3

(B) FeO(OH)

(C) As2S3

(D) CuCO3.Cu(OH)2

Answer: C. Orpiment is yellow As2S3. Yellow ochre is hydrated iron oxide.

Q58. Sauviranjana as an eye cosmetic is chemically identified as

(A) lead sulphide

(B) antimony sulphide (Sb2S3)

(C) mercuric sulphide

(D) copper carbonate

Answer: B. Sb2S3 is sauviranjana while galena PbS is surma. Kohl sticks are known from Harappan sites.

Q59. The Kannauj attar tradition uses copper stills (deg) connected by a bamboo pipe (chonga) to a receiver called

(A) puta

(B) musha

(C) kupi

(D) bhapka

Answer: D. Deg, chonga and bhapka form a simple Tiryak-patana-type set-up.

Q60. Kachha glass in India was made from silica sand and

(A) lead oxide

(B) borax only

(C) gypsum

(D) reh (sodium sulphate/carbonate efflorescence)

Answer: D. Indian Kachha glass used reh and silica sand.

Q61. Which Indian metal is placed in the notes as the first produced in bulk by distillation at Zawar?

(A) Silver

(B) Zinc

(C) Tin

(D) Mercury

Answer: B. India was the first place where zinc was produced in bulk by distillation at Zawar near Udaipur.

Q62. The seven principal Indian metals (Dhatus) include zinc under the name

(A) Tamra

(B) Vanga

(C) Yashada (Jasada)

(D) Naga

Answer: C. Zinc is Yashada or Jasada. Vanga is tin and Naga is lead.

Q63. Mercury is called in Rasashastra

(A) Loha

(B) Rasa or Parada

(C) Naga

(D) Vanga

Answer: B. Mercury is treated separately as Rasa or Parada, not among the seven Dhatus.

Q64. Gold is dissolved by

(A) hydrochloric acid alone

(B) nitric acid alone

(C) aqua regia

(D) dilute sulphuric acid

Answer: C. Au dissolves in aqua regia to give HAuCl4. It resists air and most acids.

Q65. Gold's melting point is

(A) 1538 degrees Celsius

(B) 1085 degrees Celsius

(C) 962 degrees Celsius

(D) 1064 degrees Celsius

Answer: D. Gold melts at 1064; silver 962; copper 1085; pure iron 1538 degrees Celsius.

Q66. Silver tarnishes in air because of

(A) oxygen forming Ag2O only

(B) H2S forming Ag2S

(C) CO2 forming carbonate

(D) nitrogen

Answer: B. 4Ag + 2H2S + O2 gives 2Ag2S + 2H2O.

Q67. The punch-marked Karshapana coins (c. 6th century BCE onward) were mainly of

(A) gold

(B) iron

(C) silver

(D) zinc

Answer: C. Karshapana punch-marked coins of the Mahajanapada period were mainly silver.

Q68. The principal copper ore at Khetri-Singhana is

(A) cuprite only

(B) chalcopyrite (CuFeS2)

(C) cassiterite

(D) galena

Answer: B. Copper pyrites occur at Khetri-Singhana in Rajasthan and at Singhbhum.

Q69. The self-reduction step in copper extraction is

(A) Cu2S + 3O2 gives Cu2O

(B) FeO + SiO2 gives FeSiO3

(C) CuO + C gives Cu + CO

(D) 2Cu2O + Cu2S gives 6Cu + SO2

Answer: D. Cu2O reacts with Cu2S in self-reduction. Iron is removed as FeSiO3 slag.

Q70. The Ganeshwar-Jodhpura culture of Rajasthan is noted for

(A) zinc distillation

(B) gold mining

(C) wootz steel

(D) supplying copper to the Harappans

Answer: D. The 3rd millennium BCE Ganeshwar-Jodhpura culture supplied copper to the Harappans.

Q71. Ancient Indian bloomery iron was produced at about 1100-1200 degrees Celsius, which is

(A) above the melting point, giving liquid iron

(B) exactly at the boiling point of iron

(C) below the melting point of pure iron, giving solid spongy iron

(D) sufficient to produce cast iron

Answer: C. Iron oxides were reduced to solid iron without melting (m.p. 1538 degrees Celsius). The bloom was forge welded to remove slag.

Q72. Wootz steel is made by

(A) reducing magnetite with zinc

(B) cupellation of iron with lead

(C) heating wrought iron with wood chips and green leaves in a sealed crucible at about 1300-1400 degrees Celsius

(D) forge welding discs of sponge iron

Answer: C. Iron absorbs about 1.2-2 percent carbon from decomposing organic matter and melts because carbon lowers the melting point.

Q73. Wootz is known abroad as

(A) Pig iron

(B) Damascus steel

(C) Bessemer steel

(D) Bloom iron

Answer: B. Wootz (from ukku/urukku) became known as Damascus steel after its working in Damascus.

Q74. Which wood is mentioned for the carbon source in the wootz crucible?

(A) Sapindus

(B) Acacia catechu

(C) Mallotus philippinensis

(D) Cassia auriculata

Answer: D. Cassia auriculata (tangedu or avaram) wood chips were used with leaves such as Calotropis or Convolvulus.

Q75. The Delhi Iron Pillar inscription mentions King Chandra, generally identified with

(A) Chandragupta Maurya

(B) Chandragupta II Vikramaditya

(C) Samudragupta

(D) Harshavardhana

Answer: B. The Gupta Brahmi inscription refers to Chandra, identified with Chandragupta II (c. 375-415 CE).

Q76. The Delhi Iron Pillar was fabricated by

(A) lost-wax casting

(B) crucible melting

(C) forge welding of sponge-iron discs

(D) casting in moulds

Answer: C. It is wrought iron hammered together while hot, not cast.

Q77. The Delhi Iron Pillar's corrosion resistance is attributed to dry climate and

(A) high sulphur content

(B) high manganese content

(C) a zinc coating

(D) high phosphorus, giving a protective layer containing misawite (delta-FeOOH)

Answer: D. Phosphorus of 0.1-0.25 percent promotes a passive layer of iron hydrogen phosphate hydrate and misawite. R. Balasubramaniam of IIT Kanpur showed this.

Q78. Tin pest refers to the

(A) oxidation of tin to SnO2

(B) transformation of white tin to grey tin below about 13 degrees Celsius

(C) melting of tin at 232 degrees Celsius

(D) alloying of tin with lead

Answer: B. Tin has allotropes grey and white; white converts to grey below about 13 degrees Celsius.