

PREVIOUS YEAR PAPER

UP TGT 2021 — Science (Series A)

UP TGT · 7 or 8 August 2021

125 questions · +4 for a correct answer, -0 for a wrong one · 120 minutes

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Questions from the U.P. Secondary Education Services Selection Board's paper of 7 or 8 August 2021. Each question is followed by its answer, and the answer key is repeated on the last page.

Take it as a timed practice test: exambharo.com/up-tgt/previous-year-papers/up-tgt-2021-science-series-a/

Science

1. If a neutral atom has 2K electrons, 8L electrons and 6M electrons, the total number of s-electrons, p-electrons and d-electrons separately in the atom will be

- (a) 4, 6, 1
- (b) 6, 8, 1
- (c) 6, 10, 0
- (d) 6, 10, 1

Answer: (c)

2. Which trihydride has most thermal stability?

- (a) PH₃
- (b) AsH₃
- (c) NH₃
- (d) SbH₃

Answer: (c)

3.

- (a) decrease
- (b) increase
- (c) stay unchanged
- (d) decrease or increase depending on surfaces of contact

Answer: (a)

4. Some postulates of atomic theory of matter are quoted below

- (A) The ultimate particles of a given pure substance, called atoms, are chemically alike.
- (B) Atoms can neither be created nor destroyed.
- (C) Atoms though chemically identical, differ slightly in their weights.
- (D) Chemical reactions do not change nature of atoms, but cause their rearrangement.

One of the above postulates was not part of Dalton's atomic theory. Identify it.

- (a) (A)
- (b) (B)
- (c) (C)
- (d) (D)

Answer: (c)

5. Out of the following which compound does not show sp^3 hybridization?

- (a) CH_4
- (b) BF_3
- (c) NH_3
- (d) H_2O

Answer: (b)

6.

- (a) v decreases, v unchanged, λ decreases
- (b) v and v unchanged, λ decreases
- (c) v decreases, v and λ unchanged
- (d) v , v , λ all remain unchanged

Answer: (a)

7. Which one of the following is not an element?

- (a) Diamond
- (b) Graphite
- (c) Ozone
- (d) Silica

Answer: (d)

8. Whose experiment showed that atoms have discrete energy levels?

- (a) Davisson and Germer
- (b) Franck and Hertz
- (c) Planck
- (d) Rutherford

Answer: (b)

9. Newton's Law of cooling is an approximate form of

- (a) Wien displacement law
- (b) Stefan's law
- (c) Kirchhoff's law
- (d) Jean's law

Answer: (b)

10. Which of the following species can act as a Bronsted acid?

- (a) $(CH_3)_3C^+$
- (b) $CH_3\dot{C}H_2$
- (c) $CH_3\dot{C}H_2$
- (d) $C_5H_5^-$

Answer: (a)

11. In two-dimensional space, a particle A of mass 2 kg, velocity (3, 0) is moving along line $x = 5$, while particle B of mass 3 kg, velocity (-2, 0) is moving along line $x = -3$. What is the total angular momentum of the system?

- (a) Zero
- (b) 48 clockwise
- (c) 12 anti clockwise
- (d) Cannot be determined since axis of rotation not specified

Answer: (b)

12. An electric heater draws a current of 10 A when connected to 220 V output terminal. Its resistance is

- (a) 44 Ω
- (b) 33 Ω
- (c) 22 Ω
- (d) 11 Ω

Answer: (c)

13. The following element does not show positive oxidation number

- (a) P
- (b) S
- (c) F
- (d) Cl

Answer: (c)

14. If an object travels half its total path in the last second of its fall from rest, the height of its fall, is

- (a) 20 m
- (b) 42 m
- (c) 57 m
- (d) 67 m

Answer: (c)

15. If the atomic size increases, the non-metallic character will

- (a) Increase
- (b) Decrease
- (c) Sometimes increases and sometimes decreases
- (d) No change

Answer: (b)

16. The wavelength of the matter waves associated with a fast moving sub-atomic particle depends upon – (i) charge (ii) mass (iii) velocity (iv) spin state and (v) momentum. The correct factors are

- (a) Only (iii)
- (b) Only (i), (ii) and (iii)
- (c) Only (ii), (iii) and (iv)
- (d) Only (ii), (iii) and (v)

Answer: (d)

17. The temperature scale which is independent of the properties of any substance is the

- (a) Celsius scale
- (b) Reaumur scale
- (c) Fahrenheit scale
- (d) Kelvin scale

Answer: (d)

18. Which one of the following compound contain both ionic and covalent bond?

- (a) Carbon tetrachloride
- (b) Calcium chloride
- (c) Ammonium chloride
- (d) Water

Answer: (c)

19. Arrange the following according to decreasing order of bond angles.

- (a) $\text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te} > \text{H}_2\text{O}$
- (b) $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te}$
- (c) $\text{H}_2\text{Te} > \text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se}$
- (d) $\text{H}_2\text{Se} > \text{H}_2\text{S} > \text{H}_2\text{O} > \text{H}_2\text{Te}$

Answer: (b)

20. The earth has mass M and radius R . If ' g ' is acceleration due to gravity on the surface of the earth, what is its value at height $R/3$ above the earth's surface?

- (a) $(9/16)g$
- (b) $(4/9)g$
- (c) $g/3$
- (d) zero

Answer: (a)

21. Ethylbromide on treatment with silver cyanide gives

- (a) $\text{CH}_3\text{—CH}_2\text{—CN}$
- (b) $\text{CH}_2=\text{CH}_2$
- (c) $\text{CH}_3\text{—CH}_2\text{—N}\equiv\text{C}$
- (d) $\text{H—C}\equiv\text{C—H}$

Answer: (c)

22. According to VSEPR theory, the repulsive interaction of electron pairs decrease in the order

- (a) Lone pair – Bond pair > Bond pair – Bond pair > Lone pair – Lone pair
- (b) Lone pair – Lone pair > Lone pair – Bond pair > Bond pair – Bond pair
- (c) Bond pair – Bond pair > Lone pair – Lone pair > Lone pair – Bond pair
- (d) Lone pair – Lone pair > Bond pair – Bond pair > Lone pair – Bond pair

Answer: (b)

23.

- (a) 2 m
- (b) 1 m
- (c) 0.5 m
- (d) 0.25 m

Answer: (b)

24. What will be the mass of 3.2 gram atoms of oxygen?

- (a) 10.24 gram
- (b) 102.4 gram
- (c) 1.024 gram
- (d) 1024 gram

Answer: —

25. AC, voltage 100 V, 50 Hz is applied to the ends of a choke of $L = 2$ Henry. What current will flow through it (in amperes)?

- (a) $1/(2\pi)$ A.C.
- (b) $1/(2\pi)$ D.C.
- (c) $2/\pi$ A.C.
- (d) $2/\pi$ D.C.

Answer: (a)

26. Two identical spheres A and B are at temperature 7°C and 17°C respectively. In what ratio will they emit thermal radiation?

- (a) 1 : 1.143
- (b) 7 : 17
- (c) 49 : 289
- (d) 74 : 174

Answer: (a)

27. In each of the ions given below, the charge bearing carbon atom makes a σ -bond with the other carbon atom. In such a bond formation, it utilizes a hybrid orbital which bears maximum s-character in case of

- (a) $\text{CH}_3-\bar{\text{C}}\text{H}_2$
- (b) $\text{CH}_3-\text{C}^+\text{H}_2$
- (c) $\text{H}_2\text{C}=\bar{\text{C}}\text{H}$
- (d) $\text{HC}\equiv\bar{\text{C}}$

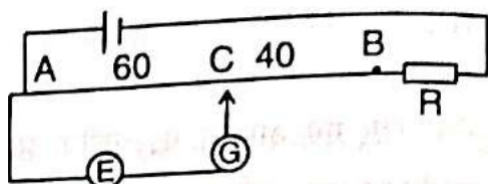
Answer: (d)

28. Given the equation $\rightarrow \text{Angular Momentum} = (\alpha\beta - \gamma/\text{time}) \times \text{velocity}$, which of the following are possible dimensions of α , β and γ ?

- (a) M, L, T
- (b) M, L, MLT
- (c) ML, ML, MLT
- (d) M^2L^{-2} , ML, T

Answer: (b)

29. In the potentiometer circuit shown, an e.m.f. E is balanced at C , 40 cm from the end B of the wire AB , which has a length of 100 cm and a resistance of $4\ \Omega$. If the potential difference across the resistor R of $200\ \Omega$ is 1.00 V , the e.m.f. E in mV is



- (a) 12
- (b) 10
- (c) 8
- (d) 6

Answer: (a)

30. The ratio of specific charge of a proton and a α -particle is

- (a) 2 : 1
- (b) 1 : 2
- (c) 1 : 4
- (d) 1 : 1

Answer: (a)

31. All the four quantum numbers of last electron of sodium atom are

- (a) $n = 3, l = 0, m = 0, s = +1/2$
- (b) $n = 3, l = 1, m = +1, s = +1/2$
- (c) $n = 3, l = 2, m = +1, s = +1/2$
- (d) $n = 2, l = 0, m = 0, s = +1/2$

Answer: (a)

32. Which of these can be the fuel in a nuclear fission reactor?

- (a) Cadmium
- (b) Thorium
- (c) Helium
- (d) Deuterium

Answer: (b)

33. The electronegativity of the atom would increase with increase in ____ character of its hybrid orbitals.

- (a) p
- (b) d
- (c) f
- (d) s

Answer: (d)

34. Arrange the following according to penetrating power of the rays.

- (a) $\beta > \alpha > \gamma$
- (b) $\gamma > \beta > \alpha$
- (c) $\alpha > \gamma > \beta$
- (d) $\alpha > \beta > \gamma$

Answer: (b)

35. Kepler's law of "Areal Velocity is constant" is equivalent to law of conservation of

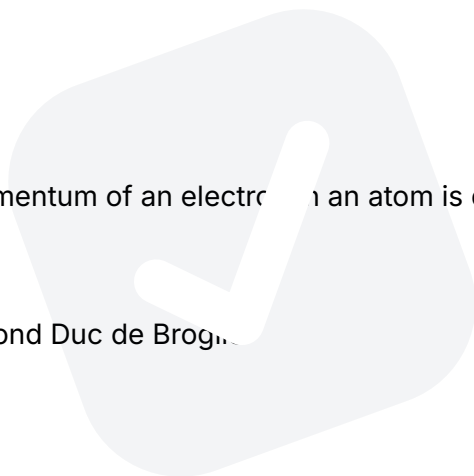
- (a) Mass
- (b) Energy
- (c) Linear Momentum
- (d) Angular Momentum

Answer: (d)

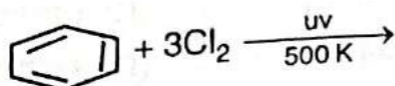
36. Who postulated that the momentum of an electron in an atom is quantized?

- (a) Erwin Schrodinger
- (b) Niels Henrik David Bohr
- (c) Louis Victor Pierre Raymond Duc de Broglie
- (d) Wolfgang Pauli

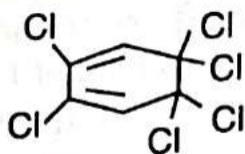
Answer: (b)



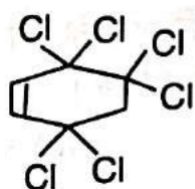
37. Identify the product of the following reaction.



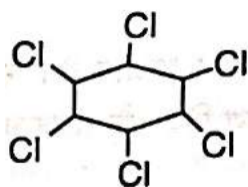
(a)



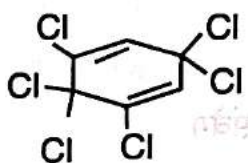
(b)



(c)



(d)



Answer: (c)

38. Two plane mirrors are placed at 60° angle to each other. How many images will be seen if the object is placed between them?

(a) 2

(b) 3

(c) 5

(d) Infinite

Answer: (c)

39. Who made the observation that there must be very large empty space within the atom?

(a) Einstein

(b) Arrhenius

(c) Chadwick

(d) Rutherford

Answer: (d)

40. An ideal transformer has 100 turns in primary and N turns in secondary. If the input is 220 V A.C. and we want 11 V output, what is the value of N ?

- (a) 1
- (b) 5
- (c) 100
- (d) 500

Answer: (b)

41. If the refractive index of glass is 1.5, the speed of light in glass is

- (a) 2.3×10^8 m/s
- (b) 3.0×10^8 m/s
- (c) 1.5×10^8 m/s
- (d) 2.0×10^8 m/s

Answer: (d)

42. Which gas is evolved when water is added to calcium carbide at room temperature?

- (a) Hydrogen
- (b) Methane
- (c) Acetylene
- (d) Allene

Answer: (c)

43. Rain is falling vertically on the ground at speed 5 m/s. If a man walks towards the East with speed 5 m/s, he will feel the rain falling at what angle to the vertical?

- (a) 0°
- (b) 30°
- (c) 45°
- (d) 60°

Answer: (b)

44. Transmission of heat by molecular collision is

- (a) Conduction
- (b) Convection
- (c) Radiation
- (d) Scattering

Answer: (a)

45. If the standard electrode potentials for zinc and copper electrodes in the cell $\text{Zn}|\text{Zn}^{2+}||\text{Cu}^{2+}|\text{Cu}$ are -0.76 V and 0.34 V respectively, the value of standard potential of the cell in volts will be

- (a) 0.11
- (b) 11.0
- (c) 1.10
- (d) 0.011

Answer: (c)

46. The temperature at which the vapour pressure of a liquid becomes equal to atmospheric pressure is called

- (a) Melting point
- (b) Freezing point
- (c) Critical temperature
- (d) Boiling point

Answer: (d)

47. The resistances in a post office box are made of

- (a) Copper
- (b) Iron
- (c) Manganin
- (d) Brass

Answer: (c)

48. Choose the correct statement.

- (a) Oxidation state of central atom is +5 in HClO and +1 in HClO_3 .
- (b) The chlorine atom will be more electronegative in HClO_3 than in HClO .
- (c) The chlorine atom will be more electronegative in HClO than in HClO_3 .
- (d) The chlorine atom have equal electronegativity in both HClO and HClO_3 .

Answer: (b)

49. Which has maximum spin multiplicity?

- (a) p^1
- (b) p^2
- (c) p^3
- (d) p^4

Answer: (c)

50.

- (a) Zero
- (b) $-GM/R$
- (c) $-3GM/8R$
- (d) $-3GM/2R$

Answer: (c)

51. Among the chemical reactions given below, identify the double decomposition reaction.

- (a) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- (b) $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$
- (c) $\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- (d) $\text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu}$

Answer: —

52. Find out the meta directing group from the following.

- (a) $-\text{Cl}$
- (b) $-\text{NH}_2$
- (c) $-\text{CH}_3$
- (d) $-\text{CN}$

Answer: (d)

53. Which mirror is best suited to focus parallel rays at a point?

- (a) Spherical convex
- (b) Spherical concave
- (c) Hyperbolic
- (d) Parabolic

Answer: (d)

54. Na^+ and F^- , both the ions have $1s^2, 2s^2 2p^6$ electronic configuration, but ionic radius of Na^+ ion is only 0.691 times that of F^- ion. If sum of their ionic radii is 231 pm, the ionic radius of F^- ion will be

- (a) 136 pm
- (b) 115 pm
- (c) 95 pm
- (d) 41 pm

Answer: (a)

55. Specific heat at constant pressure is C_p and at constant volume is C_v . Why is the ratio C_p/C_v greater than one?

- (a) For constant pressure external work is done
- (b) C_p includes rotational energy
- (c) C_p includes vibrational energy
- (d) $C_p/C_v > 1$ only for ideal gases, not for real ones

Answer: (a)

56. For an adiabatic process the first law of thermodynamics becomes

- (a) $dU = dQ - dW$
- (b) $dU = dQ$
- (c) $dU = -dW$
- (d) $dU = dW$

Answer: (c)

57. The following d-block element does not show variable valency

- (a) Cu
- (b) Zn
- (c) Mn
- (d) Fe

Answer: (b)

58. If Force (F), velocity (V) and time (T) are taken as the fundamental dimensions, instead of mass, length and time, what will be dimensions of linear momentum (P)?

- (a) FVT^{-1}
- (b) FT
- (c) FT^{-1}
- (d) VT^{-2}

Answer: (b)

59. The maximum acceleration of a SHM is α and the maximum velocity is β . What is the amplitude of oscillations?

- (a) β^2/α
- (b) α/β^2
- (c) β/α
- (d) α/β

Answer: (a)

60. Why usually covalent compounds have low melting and boiling points?

- (a) Strong van der Waal's force
- (b) Weak van der Waal's force
- (c) No van der Waal's force
- (d) Strong magnetic force

Answer: (b)

61. Which of the following is incorrect statement?

- (a) Bohr's model of atom fails to explain spectra of multielectron atoms.
- (b) Bohr's atomic model fails to explain Zeeman effect.
- (c) Bohr's atomic model fails to explain Stark effect.
- (d) Bohr's atomic model treats electron as a particle and as a wave.

Answer: (d)

62. When a p-n junction is reverse biased, its depletion region

- (a) becomes wider
- (b) becomes narrower
- (c) disappears
- (d) does not change

Answer: (a)

63. Which one is optically active?

- (a) Propanoic acid
- (b) 3-chloropropanoic acid
- (c) 2-chloropropanoic acid
- (d) 3-chloropropene

Answer: (c)

64. Out of the following set of compounds which set has bond order +1?

- (a) F_2 and O_2^{2-}
- (b) N_2 and CO
- (c) F_2 and NO^+
- (d) O_2^{2-} and N_2

Answer: (a)

65. Which property of light shows it is a transverse wave?

- (a) Refraction
- (b) Interference
- (c) Diffraction
- (d) Polarization

Answer: (d)

66. Which one of the following is a permanent effect?

- (a) Inductive effect
- (b) Electromeric effect
- (c) Resonance effect
- (d) Baker Nathan effect

Answer: —

67.

- (a) Drift speed only
- (b) Resistivity only
- (c) Resistance only
- (d) All of the above

Answer: (d)

68. [Latent heat of ice = 80 cal/gm]

- (a) $0^\circ C$
- (b) $(50/3)^\circ C$
- (c) $12.5^\circ C$
- (d) $25^\circ C$

Answer: (a)

69. There are ____ number of ions in $CoCl_3 \cdot 5NH_3$.

- (a) 4
- (b) 3
- (c) 2
- (d) 5

Answer: (b)



70. Two forces F and $-3F$ act at a perpendicular distance 'd' from each other. This is equivalent to which one of the following?

- (a) Net linear force $-2F$ only
- (b) Net linear force zero only
- (c) A net couple of moment $2Fd$ only
- (d) A net linear force of $-2F$ and a net couple of moment Fd

Answer: (d)

71.

- (a) 59°C
- (b) 62.1°C
- (c) 56.05°C
- (d) 60°C

Answer: (d)

72. The dilute solution of all the alkali metals in anhydrous liquid ammonia is

- (a) Diamagnetic
- (b) Paramagnetic
- (c) Ferromagnetic
- (d) Antiferromagnetic

Answer: (b)

73. Which shows inert pair effect?

- (a) Na
- (b) Mg
- (c) Pb
- (d) Sc

Answer: (c)

74. Given four forces

(i) Gravitational (ii) Electrostatic (iii) Magnetic (iv) Frictional

Which of these are non-conservative?

- (a) All
- (b) Only Electrostatic
- (c) Only Magnetic
- (d) Both Magnetic and Frictional

Answer: (d)

75. An automobile fitted with a lead storage battery sometimes has starting trouble in cold climate. The low power output in such a case is due to

- (a) Poor ionization of the electrolyte in it
- (b) Mobility of the ions in the electrolyte is reduced significantly
- (c) Specific gravity of sulfuric acid is increased
- (d) Specific gravity of sulfuric acid falls

Answer: (b)

76.

- (a) velocity 9.8 m/s
- (b) velocity 4.9 m/s
- (c) acceleration 9.8 m/s²
- (d) acceleration 4.9 m/s²

Answer: (c)

77. The first law of thermodynamics is equivalent to the principle of conservation of

- (a) energy
- (b) temperature
- (c) heat
- (d) volume

Answer: (a)

78. ($\sigma = 5.67 \times 10^{-8} \text{ W/m}^2\text{K}^4$)

- (a) 231 W
- (b) 462 W
- (c) 923 W
- (d) 1050 W

Answer: (c)

79. In which of the compounds given below, bonding among atoms is explained on the basis of ionic, covalent as well as coordinate covalent bonds?

- (a) Sodium carbonate
- (b) Barium chloride
- (c) Nitric acid
- (d) Ammonia

Answer: (c)

80. In a pure semiconductor

- (a) holes and electrons have equal mobility
- (b) holes have higher mobility
- (c) electrons have higher mobility
- (d) only electrons are mobile

Answer: (c)

81.

- (a) 0
- (b) 1/4
- (c) 15/16
- (d) 1

Answer: (d)

82. Among the halides of silver, the one with lowest solubility in water is

- (a) AgF
- (b) AgCl
- (c) AgBr
- (d) AgI

Answer: (d)

83. If one molecule of hydrogen gas reacts with one molecule of chlorine gas to produce two molecules of hydrochloric acid, the number of molecules present in equal volumes of different gases at identical pressure and temperature will be

- (a) Different
- (b) Same
- (c) Volume of H₂ is greater than O₂
- (d) Volume of H₂ is less than O₂

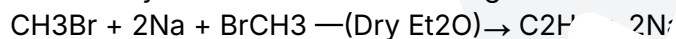
Answer: (b)

84.

- (a) in less than 10 seconds
- (b) at exactly 10 seconds
- (c) only after 10 seconds
- (d) cannot be predicted

Answer: (d)

85. Identify the name of the following reaction.



- (a) Kolbe's reaction
- (b) Hydrogenation reaction
- (c) Wurtz reaction
- (d) Corey-House reaction

Answer: (c)

86. Which one is electrophile reagent?

- (a) -OH
- (b) R - NH₂
- (c) AlCl₃
- (d) Cl-

Answer: (c)

87. Which defect of vision is corrected using cylindrical lenses in spectacles?

- (a) Myopia
- (b) Hypermetropia
- (c) Astigmatism
- (d) Loss of accommodation

Answer: (c)

88. According to the Planck's law the energy density of radiation in thermal equilibrium with matter at temperature T is given by $u(\nu, T) = \frac{8\pi h \nu^3}{c^3} \cdot \frac{1}{e^{h\nu/kT} - 1}$, where ' n ' is an integer equal to

- (a) - 1
- (b) 1
- (c) 2
- (d) 3

Answer: (d)

89. Carbon atoms in graphite have their electrons neither in pure s- nor in pure p-orbitals but contain these in the orbitals that have

- (a) 50% s- and 50% p-orbital character
- (b) 33% s- and 66% p-orbital character
- (c) 75% s- and 25% p-orbital character
- (d) 25% s- and 75% p-orbital character

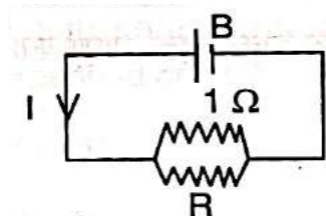
Answer: (b)

90. The mechanical equivalent of heat

- (a) has same dimension as work
- (b) has same dimension as heat
- (c) has same dimension as rate of doing work
- (d) dimensionless

Answer: (d)

91. In the circuit below, battery B has electro motive force 2 V and internal resistance 0.5Ω . What should be the value of Resistance R for current I to be maximum?



- (a) Infinite
- (b) 1Ω
- (c) 0.5Ω
- (d) Zero

Answer: (d)

92. Which among the following is a pair of isotones?

- (a) $^{23}_{11}\text{Na}$, $^{23}_{12}\text{Mg}$
- (b) $^{23}_{11}\text{Na}$, $^{24}_{12}\text{Mg}$
- (c) $^{24}_{11}\text{Na}$, $^{24}_{12}\text{Mg}$
- (d) $^{24}_{11}\text{Na}$, $^{23}_{12}\text{Mg}$

Answer: (b)

93. An electric heater of power 1000 W raises the temperature of 5 kg of a liquid from 25°C to 31°C in 2 minutes. What is heat capacity of the liquid?

- (a) $4 \times 10^3 \text{ J/kg}^\circ\text{C}$
- (b) $2 \times 10^4 \text{ J/}^\circ\text{C}$
- (c) $1.2 \times 10^5 \text{ J}$
- (d) $1 \times 10^4 \text{ J/}^\circ\text{C}$

Answer: (a)

94. Three particles of masses 2, 3 and 4 units are placed at points (0, 0, 0), (1, 1, 0) and (0, 1, 1) respectively. What is the moment of inertia of the system about the z-axis?

- (a) Zero
- (b) 4
- (c) 7
- (d) 10

Answer: (d)

95. Which element was assigned Group III A in the Mendeleev's periodic table but is a member of Group-13 in the 18-group modern periodic table?

- (a) Cu
- (b) Al
- (c) Zn
- (d) Sn

Answer: (b)

96. What will be the value of gram atoms present in 0.3 grams of sodium?

- (a) 0.02
- (b) 0.01
- (c) 0.1
- (d) 0.03

Answer: (c)

97. When a nucleus emits a β -ray, what does not change?

- (a) Sum of proton and neutron numbers
- (b) Proton number
- (c) Neutron number
- (d) Total charge

Answer: (a)

98. Which compound does not show expanded octet?

- (a) PF_6
- (b) SF_6
- (c) NO_2
- (d) H_2SO_4

Answer: (c)

99. Which shows maximum oxidation number +7 in 3d series?

- (a) Cr
- (b) Mn
- (c) Fe
- (d) Co

Answer: (b)

100.

- (a) 45°C
- (b) 35°C
- (c) 50°C
- (d) 64.3°C

Answer: (c)

101. Electro motive force represents

- (a) Force
- (b) Work
- (c) Energy per unit charge
- (d) Momentum

Answer: (c)

102. Standard reduction potentials of the two electrodes Co^{2+}/Co and Fe^{2+}/Fe are -0.28 V and -0.44 V respectively. The EMF of the cell for which cell reaction is $\text{Co} + \text{Fe}^{2+} \rightarrow \text{Co}^{2+} + \text{Fe}$ will be

- (a) -0.16 V
- (b) -0.72 V
- (c) $+0.72\text{ V}$
- (d) $+0.16\text{ V}$

Answer: (a)

103. For which one of the following concave mirror is not used?

- (a) Shaving glass
- (b) Reflector in search lights
- (c) Examination of internal parts of ear
- (d) Rear-view mirror in cars

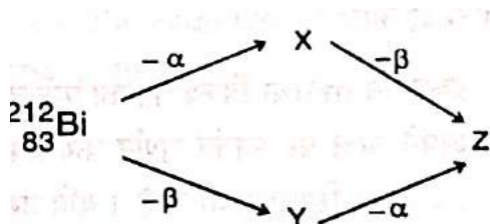
Answer: (d)

104.

- (a) $5\ \Omega$
- (b) $2.5\ \Omega$
- (c) $1.25\ \Omega$
- (d) $1\ \Omega$

Answer: (c)

105. The radio isotope $^{212}_{83}\text{Bi}$ decays with α - and β -emissions simultaneously to give the radioactive products X and Y. X and Y further decay to give an identical product Z.



The common product Z is an isotope of

- (a) ^{81}Tl
- (b) ^{82}Pb
- (c) ^{83}Bi
- (d) ^{84}Po

Answer: (b)

106. Which element was discovered through the Fraunhofer lines in the solar radiation?

- (a) Hydrogen
- (b) Helium
- (c) Lithium
- (d) Uranium

Answer: (b)

107. "A given compound always contains exactly the same proportion of elements by weight". This statement belongs to the

- (a) Law of conservation of mass
- (b) Law of multiple proportions
- (c) Law of creation of mass
- (d) Law of definite proportions

Answer: (d)

108. Modern periodic table was given by the following

- (a) Lothar Meyer
- (b) Moseley
- (c) Mendeleef
- (d) New Land

Answer: (b)

109.

- (a) mR^2t
- (b) Ft
- (c) $F Rt$
- (d) Ft/R

Answer: (c)

110. The refractive index of water $\mu_w = 4/3$ and refractive index of glass $\mu_g = 3/2$. A lens placed in air has focal length 10 cm. What will be its focal length if placed inside water?

- (a) 10 cm
- (b) 15 cm
- (c) 20 cm
- (d) 40 cm

Answer: (d)

111. Which among the oxides of transition elements listed below is not coloured?

- (a) TiO_2
- (b) Cr_2O_3
- (c) MnO_2
- (d) Fe_2O_3

Answer: (a)

112. What is the cause of nuclear fission?

- (a) Centrifugal force
- (b) Coulomb force
- (c) Surface tension
- (d) Viscous force

Answer: (b)

113.

- (a) $t_{1/2} = 0.6931/\lambda$
- (b) $t_{1/2} = \lambda/0.6931$
- (c) $t_{1/2} = 0.936/\lambda$
- (d) $t_{1/2} = \lambda/0.936$

Answer: (a)

114. Antibonding molecular orbital is formed by

- (a) Additive overlapping of two atomic orbitals
- (b) Subtractive overlapping of two atomic orbitals
- (c) Only by additive overlapping of two p orbitals
- (d) Only by subtractive overlapping of two s orbitals

Answer: (b)

115.

- (a) Zero
- (b) 5°
- (c) 7.5°
- (d) 15°

Answer: (b)



116. If the halides of calcium are arranged in the increasing order of their melting points, the correct sequence will be

- (a) $\text{CaI}_2 < \text{CaBr}_2 < \text{CaCl}_2 < \text{CaF}_2$
- (b) $\text{CaI}_2 < \text{CaBr}_2 < \text{CaF}_2 < \text{CaCl}_2$
- (c) $\text{CaF}_2 < \text{CaCl}_2 < \text{CaBr}_2 < \text{CaI}_2$
- (d) $\text{CaCl}_2 < \text{CaF}_2 < \text{CaBr}_2 < \text{CaI}_2$

Answer: (a)

117. An electron in an atom though revolves around the nucleus, the radius of its path is not constant but varies between a maximum and a minimum values. This suggestion was given by

- (a) John Dalton
- (b) Sir Ernest Rutherford
- (c) Niels Henrik David Bohr
- (d) Arnold Johannes Wilhelm Sommerfeld

Answer: (d)

118. (g = acceleration due to gravity)

- (a) $M(g + \alpha)$
- (b) $(M + \mu L)g$
- (c) $(M + \mu L/2)(g + \alpha)$
- (d) $(M + \mu L/2)g$

Answer: (c)

119.

- (a) 750 m/s^2
- (b) 500 m/s^2
- (c) 300 m/s^2
- (d) 250 m/s^2

Answer: (a)

120. Which one of the following acts as an anode in the Leclanche cell?

- (a) Carbon rod
- (b) Zinc rod
- (c) Copper rod
- (d) Aluminium rod

Answer: (b)

121. In which of the following pairs, compounds of the ion with lower oxidation state are more common and stable?

- (a) Cuprous, Cuperic
- (b) Ferrous, Ferric
- (c) Thallous, Thallic
- (d) Mercurous, Mercuric

Answer: (c)



122.

- (a) 0.16 cm^3
- (b) $0.16 \pi \text{ cm}^3$
- (c) $0.32 \pi \text{ cm}^3$
- (d) $0.48 \pi \text{ cm}^3$

Answer: (d)

123.

- (a) $\vec{r} \cdot \frac{d^2 \vec{r}}{dt^2}$
- (b) $\vec{r} \cdot \frac{d \vec{r}}{dt}$
- (c) $\vec{r} \cdot \frac{d^2 \vec{r}}{dt^2}$
- (d) None of the above

Answer: (c)

124. Which have maximum electron affinity?

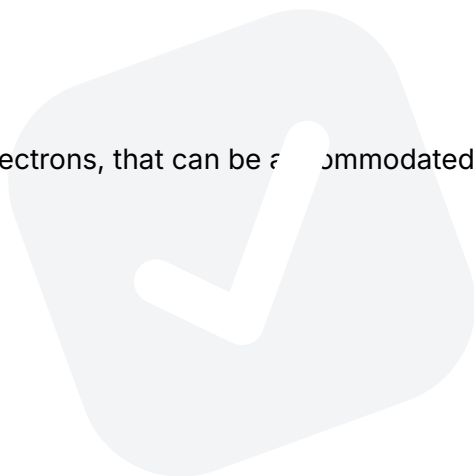
- (a) F
- (b) Cl
- (c) Br
- (d) I

Answer: (b)

125. The maximum number of electrons, that can be accommodated in an orbital is

- (a) 2
- (b) 6
- (c) 10
- (d) 14

Answer: (a)



Answer key

Answer key from the U.P. Secondary Education Services Selection Board's official answer key for this sitting. "—" means the key gave none.

Science

1	(c)	2	(c)	3	(a)	4	(c)	5	(b)	6	(a)	7	(d)	8	(b)
9	(b)	10	(a)	11	(b)	12	(c)	13	(c)	14	(c)	15	(b)	16	(d)
17	(d)	18	(c)	19	(b)	20	(a)	21	(c)	22	(b)	23	(b)	24	—
25	(a)	26	(a)	27	(d)	28	(b)	29	(a)	30	(a)	31	(a)	32	(b)
33	(d)	34	(b)	35	(d)	36	(b)	37	(c)	38	(c)	39	(d)	40	(b)
41	(d)	42	(c)	43	(b)	44	(a)	45	(c)	46	(d)	47	(c)	48	(b)
49	(c)	50	(c)	51	—	52	(d)	53	(d)	54	(a)	55	(a)	56	(c)
57	(b)	58	(b)	59	(a)	60	(b)	61	(d)	62	(a)	63	(c)	64	(a)
65	(d)	66	—	67	(d)	68	(a)	69	(b)	70	(d)	71	(d)	72	(b)
73	(c)	74	(d)	75	(b)	76	(c)	77	(a)	78	(c)	79	(c)	80	(c)
81	(d)	82	(d)	83	(b)	84	(d)	85	(c)	86	(c)	87	(c)	88	(d)
89	(b)	90	(d)	91	(d)	92	(b)	93	(a)	94	(d)	95	(b)	96	(c)
97	(a)	98	(c)	99	(b)	100	(c)	101	(c)	102	(a)	103	(d)	104	(c)
105	(b)	106	(b)	107	(d)	108	(b)	109	(c)	110	(d)	111	(a)	112	(b)
113	(a)	114	(b)	115	(b)	116	(a)	117	(d)	118	(c)	119	(a)	120	(b)
121	(c)	122	(d)	123	(c)	124	(b)	125	(a)						