SMC AND DMC PAST PAPER 2007

ENGLISH

ntify the word or phrase that needs to be changed for the tence to be correct:

Ali finds it difficult to put his idea into words. No error
A B C D E

owing for the flooded condition of roads, most of the people were unable;
A B C
to get to the offices. No error
D E

ad the passage to answer questions 3-4

ng people must be educated in modern science – its methods and its tal attitudes. Without this education they will find the modern world ly **incomprehensible**. But they cannot be good citizens of the world, or their own national state, unless they are intellectually and imaginatively are of the values which underlie human beliefs, motives and conduct. In **troubled period of human history**, religion and the humanities are as as science to the education of good members of a good society.

"Incomprehensible" can best be replaced by

A. understandable
B. explicable
C. reasonable
D. beyond their understanding

"Troubled period of human history" refers to

A. primitive times
B. modern times
C. good times
D. bad times

mplete the sentences by choosing the most appropriate word, from given lettered choices (A to D) below each.

Crystal vase breaks easily, _____ handle it with care.

A. so that
B. so much
C. so
D. so well

6. The police do not understand how the thieves _____ the house.

A. got in
B. got into
C. get into
D. get in

Choose the lettered word or phrase that is most nearly opposite in meaning to the word in capital letters.

7. MIRACLE:

A. usualness
B. wonder
C. marvel
D. sensation

8. MONOTHEIST:

A. psychologist
B. analyst
C. polytheist
D. physicist

Choose the word most similar in meaning to the capitalized one.

9. ASTONISH:

A. tranquil
B. serene
C. peaceful
D. startled
E. calm

10. BEHOLD:

A. see
B. touch
C. hear
D. smell

CHEMISTRY

11. n = 4, and l = 3, it represents

A. s orbits
B. p orbits
C. d orbits
D. f orbits

12. For the reaction

$$2NO + O_2 \rightarrow 2NO_2$$

The order of the reaction is

A. fractional order
B. first order
C. second order
D. third order
E. zero order

13. Which one has the highest degree of polarity in its molecule?

A. H-Br
B. H-I
C. H-Cl
D. H-F

14. In "contact process" for the preparation of H_2SO_4, catalyst used is

A. NO - NO_2
B. V_2O_5
C. Nickel
D. Palladium

15. Vitamin A, D, E and 'K' belong to

A. Water soluble vitamins
B. Fat soluble vitamin
C. Non-essential vitamin
D. Polar vitamins

16. The variable oxidation state of transition metals, is due to

A. involvement of outer d - electrons only
B. involvement of outer s and inner d - electrons
C. involvement of outer d and inner s - electrons
D. involvement of outer d- electrons only

17. When benzene is nitrated, concentrated nitric acid and sulphuric acids react to form an intermediate which attacks the benzene ring. Which one of the following represents this intermediate?

A. NO^+
B. NO_2
C. NO_2^-
D. NO_2^+
E. NO_3^-

18. Which of the following particles would, on losing an electron, have a half-filled set of p orbital?

A. C
B. N
C. N^-
D. O^+
E. O^-

19. Iso pentane and neo-pentane are the examples of

A. Functional group isomerism
B. Position isomerism
C. Chain isomerism
D. Metamerism

20. The bond energy for H_2 molecule is

A. 98 K cal mol^{-1}
B. 110 K cal mol^{-1}
C. 104 K cal mol^{-1}
D. 36 K cal mol^{-1}

21. Which pair of gases have same rate of diffusion at STP

A. H_2 and Ne
B. O_2 and CO
C. CO_2 and C_3H_8
D. CO_2 and SO_2

...ty of liquids depends upon

A. Temperature
B. Size of molecule
C. Shape of molecule
D. Inter-molecular forces
E. All of the above

...ula for "Plaster of Paris", is

A. $CuSO_4.5H_2O$
B. $2CuSO_4.2H_2O$
C. $(CaSO_4)_2.H_2O$
D. $MgSO_4.7H_2O$

...ydration of ethanol in the presence of H_2SO_4 (at high temperature), ...sults in the formation of

A. Ethane
B. Diethyl ether
C. Ethene
D. Butane

...e hybridization between C-C atoms in C_2H_2 (ethyne)

A. sp^3-sp^3
B. sp^2-sp^2
C. sp-sp
D. sp^2-sp^3
E. sp^2-s

$HCOOH \xrightarrow{H_2SO_4} H_2O + CO$

In this reaction H_2SO_4 is used as

A. Dehydrating agent
B. An acid
C. Catalyst
D. Sulphonating agent

27. CH_2 ... CH_2 $+ H_2O + [O] \xrightarrow{KMnO_4}$?

A. Ethanol
B. Ethanal
C. Ethylene Glycol
D. Ethane

28. $CH_3-\overset{CH_3}{\overset{|}{CH}}-CH_3$ is iso butane, its IUPAC name will be

A. 2, methyl propane
B. 1, methyl propane
C. 2, butane
D. 3, methyl propane

29. $COOH-\overset{NH_2}{\overset{|}{CH}}-CH_2-COOH$ is Aspartic acid, what is the common name?

A. Basic amino acid
B. Neutral amino acid
C. Acidic amino acid
D. Essential amino acids

30. "Tollen's Test" is used for the identification of aldehydes, and is characterized by

A. Appearance of blue colour
B. Appearance of the mirror
C. Formation of red ppt
D. Appearance of unpleasant smell

31. The order of the reactivity of the Carbonium Ion, from SN^1 view point, is

A. primary > secondary > tertiary
B. secondary > tertiary > primary
C. tertiary > secondary > primary
D. primary > tertiary > secondary

32. The solution of log (a/b) =

A. log a + log b
B. log a - log b
C. $\log(a)^b$
D. b log a

33. Proteins are gigantic polymers, of polypeptide chains; they are linked by

A. Ionic bonding
B. Glyosidic linkage
C. Peptide bonding
D. Coordinate bonding

PV = nRT is invalid for

A. Real gases
B. Ideal gases
C. Lighter gases
D. Heavier gases

Methyl orange is often used as

A. strong base-weak acid
B. strong acid-strong base
C. weak acid- weak base
D. strong acid-weak base

The reaction

$Cl_2 + 2e \rightarrow 2Cl$ is

A. Redox
B. Oxidation
C. Reduction
D. Addition

In 80 grams of NaOH, there are

A. 2 moles of NaOH
B. 1-mole of NaCH
C. 3 moles of NaOH
D. 0.5 moles of NaOH

α-rays (Alpha) are

A. fast moving electrons
B. protons
C. neutron
D. positively charged helium nuclei

The oxidation number of all the elements in free state is

A. negative
B. positive
C. zero
D. -1

"Aqua Regia" is used as solvent for gold and silver. It is mixture of HNO_3 and HCl, their ratio is

A. 3:1
B. 1:3
C. 2:2
D. 5:1

PHYSICS

41. When a force of 4 N acts on a mass of 2 kg for a time of 2 s, what is the rate of change of momentum?

A. 1 kg m s^{-2}
B. 2 kg m s^{-2}
C. 4 kg m s^{-2}
D. 8 kg m s^{-2}
E. 16 kg m s^{-2}

$\frac{\Delta P}{\Delta t}$ $\frac{mvf}{\Delta t}$ $2 \times 4 = 8$ N

42. The internal energy of a fixed mass of an ideal gas depends on

A. pressure, but not volume or temperature.
B. temperature, but not pressure or volume.
C. volume, but not pressure or temperature.
D. pressure and temperature, but not volume.

43. A system absorbs 80 J through heating while doing 100 J of external work. What is the change in the internal energy of the system?

A. -100J
B. -20J
C. +80J
D. +180J

80-100

$\Delta U = \Delta Q - \Delta W$
$= 80 - 100$
$= -20$

44. The SI unit of electrical resistance is

A. ampere
B. volt
C. farad
D. ohm

45. In a circuit, there is a current of 6 amp is changed so that the current falls to zero in 0.1 s. If an average emf of 250 volts is induced. What is the self Inductance of the circuit?

A. 41.6 henrys
B. 416 henrys
C. 4.166 henrys
D. 0.416 henrys

$E \Delta t = L \Delta I$

$\frac{250 \times 0.1}{6} = I$

$I = 4.16$ henrys

A particle performs simple harmonic motion of amplitude 0.020 m and frequency 2.5 Hz. What is its maximum speed?

A. $0.008\ ms^{-1}$
B. $0.050\ ms^{-1}$
C. $0.125\ ms^{-1}$
D. $0.157\ ms^{-1}$
E. $0.314\ ms^{-1}$

$v = x_0\omega$
$v = x_0 \frac{2\pi}{T}$
$v = x_0 2\pi f$
$v = 0.020 \times 2\pi \times 2.5$ $v = 0.314$

47. Progressive waves of frequency 300 Hz are superimposed to produce a system of stationary waves in which adjacent nodes are 1.5 m apart. What is the speed of the progressive waves?

A. $100\ ms^{-1}$
B. $200\ ms^{-1}$
C. $450\ ms^{-1}$
D. $900\ ms^{-1}$
E. $1800\ ms^{-1}$

$v = \vartheta = \nu\lambda$
$300 \times 2 \times 1.5 = v$
$v = 900$ m/s

48. A generator produces 100 kW of power at a potential difference of 10 kV. The power is transmitted through cables of total resistance 5Ω. How much power is dissipated in the cables?

A. 50 W
B. 250 W
C. 500 W
D. 1000 W
E. 50000 W

$P = VI$
$\frac{100 \times 10^3}{10 \times 10^3} = I$
$I = 10$ amp
$P = I^2R$
$P = (10)^2 \times 5$
$P = 5000$

49. Two thin lenses have focal lengths 20 cm and -40 cm. The focal length of combination in contact is

A. +20 cm
B. +40 cm
C. -20 cm
D. -40 cm

$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$
$\frac{1}{f} = \frac{1}{20} - \frac{1}{40} = \frac{1}{40}$
$f = 40$

50. The magnifying power of a telescope (Astronomical) is 8 and the distance between two lenses is 54 cm. The focal length of objective and eyepiece are respectively _____ cm.

A. 6, 48
B. 48, 6
C. 8, 54
D. 64, 8

$L = f_o + f_e$
$54 = f_e + f_o$
$M = f_o/f_e$
$8 = \frac{54 - f_e}{f_e}$
$8f_e + f_e = 54$
$9f_e = 54$
$f_e = 6$
$L = f_o + f_e$
$54 - 6 = f_o$
$f_o = 48$

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51. $r = 3(10)^2 + 4(10)^2 + 7$

$r = 300 + 400 + 7k$.

51. The position vector of a particle is given by $\vec{r} = 3t^2\hat{i} + 4t^2\hat{j} + 7\hat{k}$, find the displacement after 10 seconds.

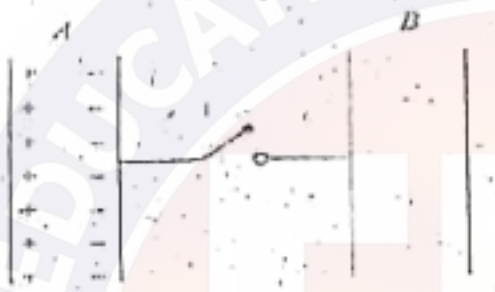
$|r| = \sqrt{(300)^2 + (400)^2 + (7)^2}$

$|r| = \sqrt{250049}$

$|r| = 500.04\,m$

(A) 500 m
B. 650 m
C. 350 m
D. 400 m

52. Capacitor A has a charge q on it whereas B is uncharged. When the switch is ON, the charge appearing on B is



(A) Zero
B. $\frac{-q}{2}$
C. q
D. 2q

53. The distance between the optical centre of the lens and its principal focus is called

A. aperture of the lens
B. pole of the lens
(C) focal length
D. None of the above

54. In a spectrometer experiment, monochromatic light is incident normally on a diffraction grating having 4.5×10^5 lines per meter. The second order line is seen at an angle of 30° to the normal. What is the wavelength of the light (approx)?

$d\sin\theta = m\lambda$

$\frac{1}{4.5\times10^5} \times \sin 30 = 2 \times \lambda$

$\frac{\sin 30}{9\times10^5} = \lambda$

$\lambda = 555.5\times10^{-9}$

A. 200 nm
B. 430 nm
C. 500 nm
(D) 556 nm
E. 589 nm

56. When the light from two lamps falls on a screen, no interference pattern can be obtained. Why is this?

A. The lamps are not point sources.
B. The lamps emit light of different amplitudes.
C. The light from the lamps is not coherent.
D. The light from the lamps is white.

57. What will be the de Broglie wave length of a mass of 6 kg moving with a velocity of 200 ms^{-1}? ($h = 6.63 \times 10^{-34}$)

$\lambda = h/p = \frac{6.63 \times 10^{-34}}{6 \times 200}$

$= 5 \times 10^{-34}$

A. 55.05×10^{-34} m
B. 0.005×10^{-34} m
C. 5×10^{-34} m
D. 5.05×10^{-34} m

58. The filament of a 240 V, 100 W electric lamp heats up from room temperature to its operating temperature. As it heats up, its resistance increases by a factor of 16. What is the resistance of this lamp at room temperature?

$P = V^2/R$

$R = \frac{(240)^2}{100}$

$R = 576$

$R_t = \frac{576}{16}$

$R_t = 36\ \Omega$

A. 36 Ω
B. 580 Ω
C. 1.5 kΩ
D. 9.2 kΩ

59. The charge on the uranium nucleus is 1.5×10^{-17} C and the charge on the α-particle is 3.2×10^{-19} C. What is the electrostatic force between a uranium nucleus and an α-particle separated by 1.0×10^{-13} m?

$F = \frac{kq_1q_2}{r^2} = \frac{9 \times 10^9 \times 1.5 \times 10^{-17} \times 3.2 \times 10^{-19}}{(1 \times 10^{-13})^2}$

$F = \frac{43.2 \times 10^{-27}}{10^{-26}}$

$F = 43.2 \times 10^{-1}$

$F = 4.32$ N

A. 4.3×10^{-11} N
B. 4.3×10^{-20} N
C. 4.3×10^{-13} N
D. 4.3 N
E. 4.3×10^{10} N

60. An electron is moving along the axis of a solenoid carrying a current. Which of the following is a correct statement about the electromagnetic force acting on the electron?

A. The force acts radially inwards.
B. The force acts radially outwards.
C. The force acts in the direction of motion.
D. No force acts.

60. Which of the following correctly relates the units for magnetic flux and magnetic flux density?

A. 1 Wb = 1 $T m^{-3}$
B. 1 Wb = 1 $T m^{-2}$
C. 1 Wb = 1 $T m^{2}$
D. 1 Wb = 1 $T m^{3}$

61. The rate of change of momentum of a body falling freely under gravity is equal to its

A. impulse
B. kinetic energy
C. power
D. weight

62. Car X is traveling at half the speed of car Y. Car X has twice the mass of car Y.
Which statement is correct?

A. Car X has half the kinetic energy of car Y
B. Car X has one quarter of the kinetic energy of car Y
C. Car X has twice the Kinetic energy of car Y
D. The two cars have the same kinetic energy

63. A ball is thrown vertically upwards. Neglecting air resistance, which statement is correct?

A. The kinetic energy of the ball is greatest at the greatest height attained.
B. By the principle of conservation of energy, the total energy of the ball is constant throughout its motion.
C. By the principle of conservation of momentum, the momentum of the ball is constant throughout its motion.
D. The potential energy of the ball increases uniformly with time during the ascent.

64. The gravitational field strength at a point P on the Earth's surface is numerically equal to

A. the acceleration of free fall at p
B. the change in potential energy per unit distance from p
C. the force acting on any body placed at p
D. the work done in bringing unit mass from infinity to p

65. Satellit... around the Earth. Wh... the relationship ... between ... orbits and their speeds

A. $v \propto r$
B. $v \propto r$
C. $v^2 \propto \frac{1}{r}$
D. $v \propto \frac{1}{r^2}$

66. An object travels at constant speed around a circle ... dius 1.0 m in 1.0s. What is the magnitude of its acceleration?

$a = \frac{v^2}{r} = \frac{(r\omega)^2}{r} = r\omega^2$

$a = r\left(\frac{2\pi}{T}\right)^2 = \frac{4\pi^2}{T^2} \quad a = 1 \times \frac{4\pi^2}{1}$

$a = 4\pi^2$

A. Zero
B. 1.0 m s^{-2}
C. 2π m s^{-2}
D. $4\pi^2$ m s^{-2}

67. An object of mass of 2 kg rotates at constant speed ... horizontal circle of radius 5 m. The time for one complete revolution ... s. What is the magnitude of the resultant force acting on the object

$F = mr\omega^2$

$F = 2 \times 5 \times \left(\frac{2\pi}{T}\right)^2$

$F = 2 \times 5 \times \left(\frac{4\pi^2}{3^2}\right)$

$F = \frac{10 \times 4\pi^2}{9} \quad F = \frac{40\pi^2}{9}$

A. $\frac{4\pi^2}{9}$ N
B. $\frac{40\pi^2}{9}$ N
C. $\frac{100\pi^2}{9}$ N
D. $\frac{400\pi^2}{9}$ N

68. Which pair includes a scalar quantity and a vector qu... ?

A. Kinetic energy and momentum
B. Potential energy and work
C. Velocity and acceleration
D. Weight and force

69. At a temperature of $25^{\circ}C$, a steel rod has a length of 10m. What will be the increase in length if temperature is raised to $35^{\circ}C$? ($\alpha = 1.1 \times 10^{-5} k^{-1}$)

$\Delta L = L \alpha \Delta T$

$\Delta L = 10 \times 1.1 \times 10^{-5} \times (35-25)$

$\Delta L = 10 \times 10 \times 1.1 \times 10^{-5}$

$\Delta L = 10^{2} \times 1.1 \times 10^{-5}$

$\Delta L = 1.1 \times 10^{-3}$

A. 11×10^{-3} m
B. 1.1×10^{-3} m
C. 111.1×10^{-3} m
D. 1111.01×10^{-3} m

70. A 60 watt bulb is operated by 240 volts. What is the current through the bulb?

A. 2.5 A
B. 0.25 A
C. 0.0125 A
D. 25 A

BIOLOGY

71. If one ribose molecule were bonded to one adenine molecule and one phosphate molecule, we would have a

A. Ribosome
B. Nucleotide
C. Nucleic acid
D. ATP
E. ADP

72. What is the correct sequence of events in the development of the embryo?

A. morula → cleavage → blastula → gastrula
B. cleavage → morula → blastula → gastrula
C. cleavage → gastrula → blastula → morula
D. blastula → cleavage → gastrula → morula
E. morula → blastula → cleavage → gastrula

73. In which form is carbon dioxide mainly transported in blood?

A. As carbamino-haemoglobin
B. As carbonic acid
C. As hydrogencarbonate
D. In solution

74. The diagram shows a section through a kidney and associated blood vessels.

In which area is there the greatest rate of movement of fluid from the blood through the walls of blood vessels?

A. A
B. B
C. C
D. D
E. E

75. The formation of chiasmata is an important feature of meiotic division because it

A. Ensures that the same genetic characteristics appear in the daughter cells as in the parents.
B. Ensures that the number of genes in the new chromosomes remains constant
C. Provides opportunities for new genotypes to arise
D. Prevents homologous chromosomes from pairing
E. Allows attachment of the chromatids to the spindle fibres

76. The mouse is known as Mus musculus. The Mus is the

A. Phylum
B. Class
C. Order
D. Genus
E. Species

77. Albinos have a genotype of aa, while all other members of population are either AA or Aa. The offspring of a cross between a heterozygous male and albino female would be

A. 100% albino
B. 100% normal
C. 50% normal,50% albino
D. 25% normal,75% albino
E. 75% normal,25% albino

78. Molds and yeast are classified as

A. Rhodophytes
B. Bryophytes
C. Fungi
D. Ciliates
E. flagellates

79. Which compound captures light energy in plants?

A. O_2
B. CO_2
C. H_2O
D. Chlorophyll
E. None of the above

80. Which of the following is not a characteristic of the kingdom Protista?

A. Members can be photosynthetic.
B. Members can be free living.
C. Some members move via flagella.
D. Some members are shaped like rods and termed bacilli.
E. Some members spend part of their life cycle inside insects.

81. Which of the following terms describes the process by which the plasma membrane moves substances inward, against a concentration gradient?

A. Facilitated diffusion
B. Active transport
C. Osmosis
D. Simple diffusion
E. Autotrophism

82. All of the following are functions of the liver EXCEPT

A. Produce bile
B. Store glycogen
C. Secrete insulin
D. Store vitamins

83. The bones at joints are held together by a tissue, the

A. Tendons
B. Connective tissue
C. Joints
D. Ligament

84. Which of the following nitrogenous bases are found in DNA?

I. Thymine
II. Cytosine
III. Uracil

A. I only
B. II only
C. I and II only
D. I and III only
E. I, II, and III

85. Arthropods can be characterized by all of the following EXCEPT

A. A hard exoskeleton
B. A water vascular system
C. Jointed appendages
D. Moulting
E. segmented body

86. The best definition of a species is

A. A group of organisms that occupy the same niche
B. A population that works together to defend itself from predators
C. A group of organisms that can mate with each other
D. A population that preys on other populations
E. A population where all members benefit from the association in some way

87. A bird that feeds on both insects and berries would be classified as a

I primary consumer
II. Secondary consumer
III. Tertiary consumer

A. I only
B. II only
C. III only
D. I and III only
E. II and III only

88. All of the following are true about the endocrine system EXCEPT

A. It relies on chemical messenger that travel through the bloodstream
B. It is a control system that has extremely rapid effects on the body
C. The hormones affect only certain "target" organs
D. It is involved in maintaining body homeostasis
E. Its organs secrete hormones directly into the bloodstream, rather then through ducts

89. Two organisms live in close association with one another. One organism is helped by the association, while the other is neither helped nor harmed. Which of the following terms best describes this relationship?

A. Mutualism
B. Commensalism
C. Symbiosis
D. Parasitism
E. Predator-prey relationship

90. Plants that have true root, stems, and leaves, as well as flowers and seeds enclosed in fruit are classified as

A. Bryophytes
B. Tracheophytes
C. Gymnosperms
D. Angiosperms
E. Endosperms

91. The Calvin-Benson cycle

A. Does not use light directly
B. Occurs in the cytoplasm
C. Releases CO_2
D. Produces ATP
E. None of the above

92. Which of the following is NOT an organelle?

A. Nucleus
B. Golgi apparatus
C. Lysosome
D. Chlorophyll
E. Chloroplast

93. Which is correctly associated?

A. RNA; thymine
B. DNA; uracil
C. RNA; replication
D. mRNA; picks up amino acids
E. RNA; ribose sugars

94. Which of the following statements about the Kreb's cycle is not true?

A. The Kreb's cycle occurs in the matrix of the mitochondrion.
B. The Kreb's cycle is linked to glycoysis by pyruvate.
C. The Kreb's cycle is the single greatest direct source of ATP in the cell.
D. Citrate is an intermediate in the Kreb's cycle.
E. The Kreb's cycle produces nucleotides such as $NADH + H^+$ and $FADH_2$.

95. Which of the following is a correct association?

A. Mitochondria: transports materials from the nucleus to the cytoplasm
B. Lysosome: digestive enzymens for intracellular use.
C. Endoplasmic reticulum: selective barrier for the cell
D. Ribosome: electron transport chain

96. Which of the following statements about skeletal muscle tissue is true?

A. In the muscle fiber, action is the thick filament.
B. The sarcoplasmic reticulum stores Ca^{2+} within a muscle cell.
C. In a muscles fiber, myosin is the thin filament.
D. Contraction of a muscle fiber can occur in the absence of Ca^{2+}

97. All viruses

A. Carry DNA
B. Carry RNA
C. Lack protein
D. Cannot reproduce outside of cells

98. Which of the following men might have explained the auk's loss of t
ability to fly with the following hypothesis?
"Since the auk stopped using its wings, the wings became smalle
and this acquired trait was passed on to the offspring."

A. Darwin
B. Mendel
C. De Vries
D. Lamarck
E. Morgan

99. A black male mouse (I) is crossed with a black female mouse, and
produce 15 black and 5 white offspring. A different black male mou
(II) is crossed with the same female, and the offspring from this m
are 30 black mice. Which of the following must be true?

A. The female mouse is homozygous.
B. Male mouse II is heterozygous.
C. Two of the mice are heterozygous.
D. All the progeny of mouse II are homozygous.
E. All three mice are homozygous.

100. What might be the best strategy to prevent ecological damage
acid rain?

A. Stock the lakes with bigger fish so that they can resist t
effects of the acid better
B. Reduce the amount of fossil fuels that are burned
C. Supply plants with excess phosphorus and water
D. Supply fungi with excess sugars and amino acids
E. Only fish when it is sunny

NTS-2007

Question Book No.

ANSWER KEY

PINK