A
SET

Booklet No. :

CH - 15

Chemical Engineering

Duration of Test : 2 Hours **Max. Marks : 120**

Hall Ticket No.

Name of the Candidate : _____

Date of Examination : _____ **OMR Answer Sheet No. :** _____

_____ _____

Signature of the Candidate **Signature of the Invigilator**

INSTRUCTIONS

1. This Question Booklet consists of **120** multiple choice objective type questions to be answered in **120** minutes.
2. Every question in this booklet has 4 choices marked (A), (B), (C) and (D) for its answer.
3. Each question carries **one** mark. There are no negative marks for wrong answers.
4. This Booklet consists of **16** pages. Any discrepancy or any defect is found, the same may be informed to the Invigilator for replacement of Booklet.
5. Answer all the questions on the OMR Answer Sheet using **Blue/Black ball point pen only.**
6. Before answering the questions on the OMR Answer Sheet, please read the instructions printed on the OMR sheet carefully.
7. OMR Answer Sheet should be handed over to the Invigilator before leaving the Examination Hall.
8. Calculators, Pagers, Mobile Phones, etc., are not allowed into the Examination Hall.
9. No part of the Booklet should be detached under any circumstances.
10. The seal of the Booklet should be opened only after signal/bell is given.

CHEMICAL ENGINEERING (CH)

1. The value of k so that the equations $x+y+3z=0$, $4x+3y+kz=0$ and $2x+y+2z=0$ have nontrivial solution is

(A) 1 (B) 0 (C) 8 (D) –4

2. If $-\sqrt{5}$ and $\sqrt{5}$ are eigen values of the matrix $\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ then the third eigen value is

(A) 2 (B) $\sqrt{5}$ (C) 0 (D) 1

3. The percentage of error in the area of an ellipse when an error of +1 percentage is made in measuring the major and minor axis is

(A) -2 (B) +2 (C) 0 (D) 1

4. The curl of the vector field $\bar{A}=(x^2+xy^2)i+(y^2+x^2y)j$ is

(A) $\hat{0}$ (B) $i-j$ (C) $2i+3j$ (D) $-i$

5. The particular integral of the differential equation $(D^2+4)y=\cos 2x$ is

(A) $\frac{x}{4}\sin 2x$ (B) $\frac{x}{4}\cos 2x$ (C) $\frac{1}{8}\sin 2x$ (D) $\frac{1}{4}\sin 2x$

6. The Laplace transform of the function $\frac{1}{\sqrt{\pi t}}$ is

(A) $\frac{1}{\sqrt{\pi}}$ (B) $\frac{\pi}{\sqrt{s}}$ (C) $\frac{1}{s^2}$ (D) $\frac{1}{\sqrt{s}}$

7. The residue at the pole 2 of the function $\frac{2z+1}{z^2-z-2}$

(A) $\frac{3}{5}$ (B) $-\frac{3}{2}$ (C) $-\frac{1}{2}$ (D) $\frac{5}{3}$

8. If $P(A)=0.4$, $P(B)=p$ and $P(A\cup B)=0.6$, then the value of p so that A and B are independent is

(A) 0.7 (B) $\frac{1}{2}$ (C) 0.4 (D) $\frac{1}{3}$

9. The order of convergence of the Newton Raphson method is

(A) 1^{st} (B) 3^{rd} (C) 4^{th} (D) 2^{nd}

10. If h is the step size and if $f(x)$ is given in the table then by Simpson $1/3^{rd}$ method $\int_{x_0}^{x_5} y(x)dx$ is equal to

x	x_0	x_1	x_2	x_3	x_4	x_5
$y(x)$	y_0	y_1	y_2	y_3	y_4	y_5

(A) $\frac{h}{2}\left[y_0+2(y_1+y_3)+4(y_2+y_4)+y_5\right]$

(B) $\frac{h}{3}\left[y_0+4(y_1+y_3)+2(y_2+y_4)+y_5\right]$

(C) $\frac{h}{2}\left[y_0+2(y_1+y_2+y_3+y_4)+y_5\right]$

(D) $\frac{h}{3}\left[y_0+2(y_1+y_3)+4(y_2+y_4)+y_5\right]$

11. The pressure difference between inside and outside of a liquid drop is

(A) 16σ /d (B) 8σ /d (C) 4σ /d (D) 2σ /d

12. Weight of liquid that rises in a capillary tube is supported by

(A) horizontal component of surface tension
(B) the Drag force
(C) vertical component of surface tension
(D) the viscous force

13. The continuity equation is a mathematical statement of

(A) law of conservation of energy (B) law of conservation of mass
(C) law of conservation of momentum (D) law of conservation of mass and energy

14. The ratio of inertial forces to gravitational forces is better known as

(A) Reynolds number (B) Weber number
(C) Euler number (D) Froude number

15. Dynamic similarity is

(A) the similarity of discharge (B) the similarity of forces
(C) the similarity of stream line patterns (D) the similarity of location

16. Buoyant force acting on a floating/submerged body is

(A) equal to the weight of liquid displaced and acts vertically downwards

(B) the net force acting on a body due to the surrounding fluid

(C) the net force necessary to maintain equilibrium of the body

(D) equal to the weight of liquid displaced and acts vertically upwards

17. The ratio of pressure forces to inertial forces is

(A) Froude number (B) Weber number

(C) Euler number (D) Mach number

18. A body falls freely for distance S from rest. Its velocity v is

(A) $K (Sg)^{0.5}$ (B) $K (Sg)$ (C) $K (Sg)^{2}$ (D) $K (Sg)^{1.5}$

19. The ratio of point velocity to the maximum velocity in laminar flow through a pipe is

(A) $1 -(r/R)^2$ (B) $1 - (r/R)$ (C) $(r/R)^2$ (D) (r/R)

20. In sudden enlargement in a horizontal pipe, the velocity head is converted to

(A) potential head (B) kinetic head (C) not converted (D) pressure head

21. Navier–Stokes equation is useful for

(A) non–viscous flow (B) Viscous flow

(C) turbulent flow (D) in viscid flow

22. A stagnation point is where

(A) the pressure is zero (B) the flow velocity is zero

(C) the total energy is zero (D) the flow resistance is the maximum

23. A foot valve is a

(A) direction control valve (B) relief valve

(C) pressure reducing valve (D) back pressure valve

24. For compressing and moving gases, the pressure difference produced is the maximum for

(A) Fans (B) Vacuum Pumps

(C) Blowers (D) Compressors

25. The equivalent diameter of a 6 cm x 12 cm conduit is,

(A) 2 cm (B) 8 cm (C) 72 cm (D) 6 cm

26. For a cylindrical particle, whose L/D is one, the sphericity is

(A) $2^{1/2}$ (B) 1 (C) <1 (D) 2

27. The ratio of the actual mesh dimension of any screen to that in the next smaller screen in that series is

(A) 1.41 (B) 2 (C) 1.19 (D) 1.73

28. The specific surface of spherical particles – diameter relation is

(A) proportional to diameter^2 (B) directly proportional

(C) inversely proportional (D) proportional to equivalent diameter^2

29. The crushing efficiency of a machine will be about

(A) 20 % (B) 80 % (C) 10 % (D) 2 %

30. Rittinger's law relates the work required in crushing to

(A) the number of particles crushed (B) the new surface created

(C) the hardness of the particles (D) the surface area of the feed particles

31. The mechanism of size reduction in Ultra fine grinders is primarily

(A) cutting (B) attrition (C) impact (D) compression

32. Critical speed of a ball mill depends on (r is ball radius and R is mill radius)

(A) only on mill radius, R (B) Only on ball radius, r

(C) Difference in R and r (D) $(R - r)^{1/2}$

33. A filter aid in the slurry will

(A) increase the cake porosity (B) Decrease cake porosity

(C) increase cake compressibility (D) Decrease cake compressibility

34. During constant pressure filtration, the flow rate of the filtrate

(A) is constant (B) increases (C) is steady (D) decreases

35. The dimensions of filter medium resistance are

(A) ML^{-1} (B) L^{-1} (C) $M^{-1}L$ (D) $M^{-1}L^{-1}$

36. If a plot of time vs. filtrate volume is prepared, it will be a

(A) parabola (B) straight line (C) hyperbola (D) exponential curve

37. Net positive suction head (NPSH) of a centrifugal pump is defined as

(A) velocity head + pressure head, at suction

(B) velocity head + pressure head, at discharge

(C) velocity head + pressure head, at suction – vapor pressure of liquid

(D) velocity head + pressure head, at discharge – vapor pressure of liquid

38. A pump normally preferred for pumping slurries

(A) Centrifugal pump (B) Gear pump

(C) Screw pump (D) Lobe pump

39. Vane pumps

(A) operate at low efficiencies

(B) cannot provide variable displacement

(C) do not depend on centrifugal force for their operation

(D) can have large discharge under high pressures

40. In a rotary drum filter, the controlling resistance is

(A) the cake resistance (B) the filter medium resistance

(C) the piping resistance (D) All the above

41. Differential settling methods depend on

(A) Difference in densities (B) Difference in terminal velocities

(C) Difference in particle sizes (D) Difference in liquid–solid density

42. Temperature and pressure levels recommended for $SO_2 + ½\ O_2 \rightarrow SO_3$

(A) Low temperature, low pressure (B) Low temperature, high pressure

C) High temperature, high pressure (D) High temperature, low pressure

43. Which of the following is a crystalline form of carbon ?

(A) Charcoal (B) Diamond (C) Lampblack (D) Soot

44. Which one among the following is thermoplastic ?

(A) Polyethylene (B) Silicone (C) Bakelite (D) polyester

45. Teflon is a polymeric product of

(A) CF_4 (B) $CH_2 = CHF$ (C) C_2F_2 (D) C_2F_4

46. Pasteurization of milk involves

(A) Heating to boiling

(B) Cooling followed by moderate heating

(C) Cooling to 0 °C

(D) Moderate heating followed by cooling

47. Catalyst normally used in the hydrogenation of oils is a finely divided

(A) Copper (B) Iron (C) Nickel (D) Silver

48. A synthetic detergent constituent, that prevents re–deposition of dirt on the fabric, is

(A) Sodium carboxy methyl cellulose (B) Sodium silicate

(C) Sodium tripolyphosphate (D) Sodium sulfate

49. The anodic reaction in the electrolysis of brine solution is

(A) Oxidation of chlorine ions (B) Reduction of sodium ions

(C) Oxidation of sodium ions (D) Reduction of chlorine ions

50. The major constituents of coke oven gas are

(A) CH_4, CO_2 and H_2O (B) CH_4, CO and H_2

(C) CH_4, CO and N_2 (D) CO_2, CO and H_2

51. Temporary hardness of water can be removed by adding

(A) $CaCO_3$ (B) $CaCl_2$ (C) $Ca(OH)_2$ (D) $NaHCO_3$

52. Fourier number is associated with

(A) Convection (B) Conduction (C) Radiation (D) none of the above

53. A sphere, a cube and a thin circular plate, all made of the same material and having the same mass, are available at a temperature of 250 °C. When they are exposed to the ambient air, which object will provide the lowest heat transfer rate ?

(A) circular plate (B) cube

(C) sphere (D) all will cool at the same rate

54. Usually, the thermal conductivity of a non–homogeneous material

(A) decreases with increasing temperature

(B) decreases with increasing apparent bulk density

(C) increases with increasing temperature but decreases with increasing apparent bulk density

(D) increases both with increasing temperature and increasing apparent bulk density

55. The maximum heat loss from a pipe occurs when the radius of insulation equals

(A) the ratio of thermal conductivity to heat transfer coefficient

(B) the ratio of heat transfer coefficient to thermal conductivity

(C) the radius of the pipe

(D) the product of thermal conductivity and heat transfer coefficient

56. The ratio of Buoyant forces to viscous forces is better known as

(A) Prandtl number (B) Rayleigh number

(C) Stanton number (D) Grashof number

57. In natural convection, fluid moves under the influence of

(A) surface tension forces

(B) buoyant forces arising from changes in density

(C) both A and B

(D) none of the above

58. When the Prandtl number is greater than unity, the thermal boundary layer

(A) and hydrodynamic boundary layer are identical

(B) is thicker than the hydrodynamic boundary layer

(C) is thinner than the hydrodynamic boundary layer

(D) disappears

59. The distribution of shear stress in a stream of fluid in a circular tube is

(A) parabolic with radius for both laminar and turbulent flows

(B) linear with radius for both laminar and turbulent flows

(C) parabolic with radius for turbulent flow

(D) linear with radius for laminar flow

60. Film wise condensation

(A) is less common than drop wise condensation

(B) occurs on non–wettable surfaces

(C) is characterized by high heat transfer coefficients than that for drop wise condensation

(D) is characterized by a thin liquid film forming over the entire surface

61. The average heat transfer coefficient for drop wise condensation is

(A) less than that of film wise condensation

(B) greater than that of drop wise condensation

(C) equal to that of film wise condensation

(D) cannot be compared

62. The total emissive power (E) of a gray body at a surface temperature of T is given by

(A) $E = \varepsilon\sigma T^4$ (B) $E = (1-\varepsilon)\sigma T^4$ (C) $E = (\varepsilon-1)\sigma T^4$ (D) $E = \sigma T^4$

63. For the same process temperatures, the ratio of LMTD in parallel flow to the LMTD in counter flow in liquid–liquid heat exchanger is always

(A) <1 (B) $=1$ (C) >1 (D) ∞

64. If some of the tubes in a heat exchanger are sealed, the effective heat transfer area will

(A) increase (B) remain same (C) decrease (D) none

65. A certain quantity of liquid is heated for 10 minutes by an electric resistor, which draws 3 amperes current at 200 volts. The liquid is continuously stirred by a paddle wheel, which was operated by a 200 W rating motor. The amount of energy transferred to the liquid is

(A) 480 kJ (B) 360 kJ (C) 800 kJ (D) 240 kJ

66. The thermal efficiency of an ideal Rankine cycle is lower than that of a Carnot cycle operating between the same temperature limits because

(A) energy rejection does not take place at constant temperature

(B) the turbine is not reversible and adiabatic

(C) energy addition does not take place at constant temperature

(D) the pump is not reversible and adiabatic

67. A gas contained in a cylinder is compressed reversibly from the initial state (P_1, V_1) to the final state (P_2, V_2) according to the path, PV^n = constant. The work done on the gas

(A) $n(P_1V_1 - P_2V_2)$ (B) $\dfrac{P_2V_2 - P_1V_1}{1-n}$

(C) $\dfrac{P(V_1 - V_2)}{n}$ (D) $\dfrac{P(V_1 - V_2)}{1-n}$

68. When wet steam is throttled to a low pressure, its temperature

(A) increases (B) does not change

(C) gets halved (D) decreases

69. Identify the correct set of approximations made in the thermodynamic analysis of internal combustion engines

P. The combustion process is replaced by an equivalent energy addition process

Q. The working fluid is a mixture of carbon dioxide and water vapor

R. The exhaust process is replaced by an equivalent energy rejection process

S. The working fluids have constant heat capacities

(A) P, R, S (B) P, R (C) R, S (D) P, Q, R

70. A 1–ton air conditioning unit, with a seasonal energy efficiency rate of 10 is used for 1000 hr per year. If the cost of electricity is ₹ 5 per kWh, the annual cost of power consumption by the air conditioner is

(A) ₹ 10000 (B) ₹ 5000 (C) ₹ 6000 (D) ₹12000

71. Activity coefficient is a partial molar property with respect to

(A) G^R /RT (B) Δ G /RT (C) G^E /RT (D) G /RT

72. The coordinates of Mollier diagram are

(A) S & H (B) ln P & H (C) T & S (D) T & H

73. A system, going from P to Q, absorbs 100 kJ of heat and does 30 kJ of work. In the return direction if the system does 30 kJ of work, what is the heat effect ?

(A) –70 kJ (B) – 100 kJ (C) – 40 kJ (D) –130 kJ

74. The meaning of second law of thermodynamics is

(A) Work conversion to heat impossible

(B) Heat conversion to work impossible

(C) Work conversion to heat is partial

(D) Heat conversion to work is partial

75. What is the mass of CO contained in a container of volume 44.8 m^3 at STP ?

(A) 28 kg (B) 56 kg (C) 14 kg (D) 44 kg

76. Binary Diffusion Coefficient for gases vary with

(A) temp (B) $(temp)^{1.5}$ (C) $(temp)^2$ (D) $(temp)^{-1}$

77. Which of the following will have the dimensions of length/time

(A) Film thickness

(B) Diffusion coefficient

(C) Volumetric mass transfer coefficient

(D) Mass transfer coefficient

78. Schmidt number is the ratio of

(A) thermal diffusivity to mass diffusivity

(B) momentum diffusivity to thermal diffusivity

(C) momentum diffusivity to mass diffusivity

(D) none of the above

79. Relative volatility is defined as (y is mole fraction of more volatile component in vapour and x that in the liquid)

(A) $y / (1-y)$ (B) y / x

(C) $(1-y) / y (1-x)$ (D) $y (1-x) / x (1-y)$

80. Gas Permeability (P) is defined as

(A) P = Volume/ pressure gradient (B) P = 1/ Diffusivity

(C) P = volume x pressure gradient (D) P = Diffusivity / Solubility

81. According to surface renewal theory, mass transfer coefficient is proportional to

(A) $D_{AB}^{0.5}$ (B) D_{AB} (C) $D_{AB}^{1.5}$ (D) $D_{AB}^{0.7}$

82. According to Chilton–Colburn analogy for mass transfer

(A) $N_{St} N_{Sc}^{2/3} = f/8$ (B) $N_{St} N_{Sc}^{1/3} = f/2$

(C) $N_{St} N_{Sc}^{2/3} = f/2$ (D) $N_{St} N_{Sc}^{1/3} = f/8$

83. The temperature at which a gas–vapour mixture gets saturated on cooling at constant pressure and out of contact with water is

(A) Bubble temperature (B) Dew temperature

(C) Wet bulb temperature (D) Saturation Temperature

84. Number of independent variables a binary mixture in vapour –liquid equilibrium will have at azeotropic composition is

(A) 0 (B) 1 (C) 3 (D) 2

85. If the activity coefficient crosses unity as mole fraction of more volatile component in a binary mixture changes, the indication is that

(A) an azeotrope is formed (B) the separation is easier

(C) the separation is difficult (D) the system is ideal

86. Absorption factor is

(A) Slope of the driving force line/ slope of the operating line

(B) Number of transfer units/ number of theoretical plates

(C) Slope of the equilibrium curve / slope of the operating line

(D) Slope of the operating line / slope of the equilibrium curve

87. A horizontal q–line in McCabe –Thiele procedure indicates that the feed is a

(A) Saturated liquid (B) Saturated Vapour

(C) Vapour–liquid mixture (D) Unsaturated liquid

88. If the vapour pressure of water retained by a solid is less than the vapour pressure of pure water, then the water content is known as

(A) Critical Moisture content (B) Free Moisture content

(C) Bound Moisture (D) Equilibrium Moisture content

89. An analytical expression to determine the minimum number of stages required for a specified separation by fractionation is known as

(A) Rayleigh equation (B) Kremser equation

(C) McCabe equation (D) Fenske equation

90. In flashing, the final pressure is

(A) the bubble pressure (B) the dew pressure

(C) Between bubble and dew pressures (D) above dew pressure

91. Liquid A decomposes by an irreversible first order reaction and the half–life of this reaction is 20 min. The time required for 75 % conversion is

(A) 30 min (B) 35 min (C) 40 min (D) 25 min

92. In a chemical reaction, it is observed that the rate increases 4-fold, as the concentration is doubled. What is the order of the reaction ?

(A) 1 (B) 2 (C) 1.5 (D) 4

93. The dimensions of rate constant are (n is the order of the reaction)

(A) $time^{-1}$ (Concentration) (B) $time^{-1}$ $(Concentration)^{n}$

(C) time $(Concentration)^{1-n}$ (D) $time^{-1}$ $(Concentration)^{1-n}$

94. Higher activation energy of a reaction indicates that the reaction is

(A) Temperature sensitive (B) Temperature insensitive

(C) More Complete (D) Higher temperatures are preferable

95. A reaction, $2A \rightarrow$ products exhibit second order kinetics. A plot of t vs $X_A/(1-X_A)$ will then have a slope of

(A) KC_{AO} (B) KC_{AO}^2 (C) $1/(KC_{AO})$ (D) C_{AO}

96. For an isothermal gas phase reaction, $A \rightarrow 2B + C$, the fractional change in volume of the system between complete and no conversion is

(A) 3 (B) 1 (C) 4 (D) 2

97. For identical C_{AO}, F_{AO} and X_A, and for all positive reaction orders, the ratio of volume of a CSTR to that of a plug flow reactor is

(A) <1 (B) >1 (C) =1 (D) = reaction order

98. N plug flow reactors in series, each with a volume of V/N will give the same conversion as a single plug flow reactor of volume V, all else remaining the same. This is valid for

(A) first order reactions (B) second order reactions

(C) all reaction orders (D) Zero order reactions

99. Exit age distribution of fluid leaving a vessel is useful to

(A) study the flow pattern in the reactor

(B) study the reaction mechanism and progress

(C) study the reaction kinetics

(D) determine the flow rates

100. The action of a catalyst is due to its ability to change the

(A) Activation Energy

(B) Heat of reaction

(C) Equilibrium constant

(D) Temperature & pressure dependence

101. For large values of the Thiele modulus $(L(k/D)^{1/2})$, in case of solid catalyzed first order reaction, effectiveness factor (ε) is given by

(A) $\varepsilon = 1$ (B) $1 / L(k/D)$ (C) $\varepsilon = 1 / L(k/D)^{1/2}$ (D) $L(k/D)^{1/2}$

102. Which one of the following is a dynamic characteristic of a measuring instrument ?

(A) Reproducibility (B) Speed of response

(C) Sensitivity (D) Range and span

103. As temperature is increased, refractive index of a liquid

(A) decreases (B) increases

(C) not affected (D) varies with square of temperature

104. An example for a natural second order system is

(A) thermometer (B) two capacity liquid level system

(C) Thermometer in a thermo well (D) U-tube Manometer

105. When a first order system(time constant T) is subjected to a ramp input(At) , the dynamic error is

(A) $(AT)^{0.5}$ (B) AT (C) 0.5 AT (D) 2 AT

106. Bolometer is used in the measurement of

(A) Pressure (B) Level (C) Flow (D) Temperature

107. Ionization gauge is used to measure

(A) Low pressures (B) High pressures

(C) Near atmospheric pressures (D) Ionization current

108. Phase angle of a second order system to a sinusoidal input is

(A) between 0 and +90 (B) between 0 and –180

(C) between 0 and +180 (D) between –90 and +90

109. A decrease in proportional band of a controller

(A) decreases decay ratio (B) improves the stability of a system

(C) increases decay ratio (D) decreases offset

110. For a stable system, as per Bode stability criterion, the amplitude ratio at a phase angle of (–180°)

(A) shall be greater than unity (B) shall be equal to zero

(C) shall be less than unity (D) shall be equal to unity

111. An equal percentage valve is of

(A) increasing sensitivity type (B) decreasing sensitivity type

(C) constant sensitivity type (D) insensitive type

112. Biochemical digestion of an effluent is basically a process of

(A) Reduction (B) Hydration (C) Dehydration (D) Oxidation

113. A piece of equipment has an initial value of ₹ 25000, a service life of 8 years and finally a salvage value of ₹ 1000. What is the annual depreciation cost as per straight line method ?

(A) ₹ 2400 (B) ₹ 2500 (C) ₹ 2600 (D) ₹ 3000

114. Grading of a complex fertilizer is based on the following :

(A) N : P : K (B) $N : P_2O_5 : K$

(C) $N : P_2O_5 : K_2O$ (D) $N : P : K_2O$

115. Which of the following hydrocarbon series is almost absent in crude petroleum ?

(A) Naphthenes (B) Aromatics (C) Paraffins (D) Olefins

116. The emission of a β–particle causes the resultant nucleus to have

(A) less atomic weight (B) less atomic number

(C) more atomic weight (D) more atomic number

117. The angle subtended by a vertical line to the point directly overhead on the line of sight of the sun is called

(A) latitude angle (B) declination angle

(D) Incident angle (D) Zenith angle

118. Which method of depreciation computation will provide the lowest book value at all times

(A) Straight line method (B) Diminishing balance method

(C) Sinking fund method (D) Sum of the years digit methods

119. A dimensionless number used to modify capital cost required to erect a chemical plant from a past date to a later time, is known as

(A) Cost Index (B) Scale up factor

(C) Six–tenth factor (D) Inflation index

120. A cylindrical vessel needs to be designed to store a highly volatile liquid, under high pressure. Which closure head do you recommend ?

(A) Hemispherical (B) Torispherical

(C) Ellipsoidal (D) Flat end

SPACE FOR ROUGH WORK