

Admission test -Degree Course in Pharmacy, University of Rome 'Tor Vergata', Academic Year 2017/2018

- 1** When the anion  $\text{MnO}_4^-$  is transformed into cation  $\text{Mn}^{2+}$ , manganese:
- A Goes from oxidation number +7 to +2 and is reduced  
B Goes from oxidation number +7 to +2 and is oxidized  
C Goes from oxidation number -1 to +2 and is reduced  
D Goes from oxidation number -2 to +2 and is reduced  
E None of the above
- 2** Indicate which is the sulfite ion:
- A  $\text{SO}_4^{2-}$   
B  $\text{SO}_3^{2-}$   
C  $\text{S}^{2+}$   
D  $\text{S}_2\text{O}_3^{2-}$   
E  $\text{S}^{2-}$
- 3** Given that the atomic mass of carbon is 12, how many atoms are present in 0,36g of carbon?
- A 50  
B 0,03  
C  $6,022 \times 10^{23}$   
D  $1,8066 \times 10^{22}$   
E 12
- 4** If in a water solution the concentration of  $\text{H}_3\text{O}^+$  ions is 0,001M, what is the pH?
- A 1  
B 0,001  
C 3  
D 30  
E 7
- 5** How many grams of ethyl alcohol ( $\text{C}_2\text{H}_5\text{OH}$ , MW 46,1) are present in 500mL of a solution 0,2M?
- A 4,61g  
B  $6,022 \times 10^{23}\text{g}$   
C  $1,0 \times 10^{23}\text{g}$   
D 0,461g  
E None of the above
- 6** Methanol is:
- A An organic compound containing a hydroxy group  
B An aromatic organic compound  
C A halogenated organic compound  
D An organic compound containing an amino group  
E None of the above
- 7** An atom that contains 19 protons, 20 neutrons and 19 electrons has the following mass number:
- A 19  
B 20  
C 39  
D 58  
E 19,5
- 8** Which of the following solutions has  $\text{pH} > 7$ ?
- A 50mL of a 0,1M solution of NaCl  
B 50mL of a 0,1M solution of HCl  
C 250mL of a 0,1M solution of HCl  
D 50mL of a 0,1M solution of NaOH  
E 50mL of a 0,1M solution of  $\text{NH}_4\text{Cl}$
- 9** A 0,5 M solution of KCl contains:
- A 1mol of solute per liter of solution  
B 0,5g of solute per liter of solution  
C 0,5g of solute per Kg of solution  
D 1mole of solute per Kg of solution  
E 0,5moles of solute per liter of solution
- 10** Which of the following couples of atoms can form a covalent bonding?
- A H; Na  
B H; Br  
C Na; Br  
D Ca; Cl  
E Ca; O

- 11 A gas sample at  $T=0^{\circ}\text{C}$  and  $P= 1 \text{ atm}$  has volume  $V= 44,8 \text{ L}$ , contains:**
- A About 1 mole
  - B About 1gram
  - C About 2 moles
  - D About 2grams
  - E About 2 molecules
- 12 Ice and water constitute a system:**
- A Chemically heterogeneous and physically heterogeneous
  - B Chemically homogeneous and physically heterogeneous
  - C Chemically homogeneous and physically homogeneous
  - D Chemically heterogeneous and physically homogeneous
  - E None of the above
- 13 Which species can be formed upon combustion of methane ( $\text{CH}_4$ )?**
- A Hydrogen and oxygen
  - B Carbon and hydrogen
  - C Propane
  - D Methane gas
  - E Carbon dioxide and water
- 14 In order to neutralize 100mL of a 0,01M solution of KOH it is necessary to add:**
- A 0,1mL of  $\text{H}_2\text{O}$
  - B 0,1mL of a 1 M solution of NaOH
  - C 1mL of a  $10^{-2}$  M solution of  $\text{HNO}_3$
  - D 100mL of a  $10^{-2}$  M solution of  $\text{HNO}_3$
  - E 100mL of a  $10^{-2}$  M solution of NaOH
- 15 In order to neutralize 100ml of a  $10^{-3}\text{M}$  solution of HCl it is necessary to add:**
- A 1000ml of  $\text{H}_2\text{O}$
  - B 10ml of a 0.01 M solution of NaOH
  - C 10ml of a 0.01 M solution of KCl
  - D 1ml of a  $10^{-2}$  M solution of  $\text{HNO}_3$
  - E 1ml of a  $10^{-2}$  M solution of NaOH
- 16 In eukaryotic cells, DNA occurs only in:**
- A Cell nuclei, mitochondria, Golgi apparatus
  - B Mitochondria, Golgi apparatus, chloroplasts
  - C Cell nuclei, lysosomes, chloroplasts
  - D Cell nuclei, mitochondria, chloroplasts
  - E Mitochondria, chloroplasts, lysosomes
- 17 Two parents who do not exhibit phenylketonuria (PKU) have a son with PKU. Which of the following conclusions can be drawn from this situation?**
- A The allele for PKU is located on the Y chromosome
  - B PKU is a dominant trait
  - C PKU is a recessive trait
  - D A mutation occurred in the sperm of the father
  - E None of the above
- 18 Which of the following cellular processes normally produces ATP from glucose in the absence of oxygen?**
- A Krebs cycle
  - B Glycolysis
  - C Chemiosmosis
  - D Calvin cycle
  - E None of the above
- 19 Which of the following best describes the pathway of a protein from its manufacture to its secretion from the cell?**
- A Endoplasmic reticulum  $\rightarrow$  Golgi complex  $\rightarrow$  secretory vesicle
  - B Secretory vesicle  $\rightarrow$  endoplasmic reticulum  $\rightarrow$  Golgi complex
  - C Secretory vesicle  $\rightarrow$  Golgi complex  $\rightarrow$  endoplasmic reticulum
  - D Golgi complex  $\rightarrow$  endoplasmic reticulum  $\rightarrow$  secretory vesicle
  - E None of the above
- 20 A person touches a hot object and immediately moves her finger away from it. Which of the following structures is the first to receive an impulse triggered by the stimulus?**
- A Synapse
  - B Ventral root ganglion
  - C Motor neuron
  - D Sensory neuron
  - E None of the above

- 21 The sympathetic nervous system**  
 A Increases heart rate  
 B Is voluntary  
 C Is activated mainly in sleep  
 D Activates digestion  
 E None of the above
- 22 A health disorder that results from a deficiency of thyroid hormone production in adults and is characterized by a low metabolic rate, increase in body weight and tiredness is:**  
 A Hyperthyroidism  
 B Goiter  
 C Cretinism  
 D Hypothyroidism  
 E None of the above
- 23 In eukaryotic cells, protein synthesis takes place at the:**  
 A Nucleus  
 B Mitochondria  
 C Chloroplasts  
 D Ribosomes  
 E Lysosome
- 24 The four bases which form the code words for DNA are:**  
 A UTAC  
 B ACTU  
 C AGCU  
 D ATCG  
 E None of the above
- 25 Prokaryotic cells are different from eukaryotic cells because prokaryotic cells:**  
 A Are much bigger  
 B Have no cell nuclei  
 C Have cell nuclei  
 D Have no cell wall  
 E Have mitochondria and chloroplasts
- 26 The DNA double helix is stabilized by hydrogen bonds between:**  
 A Purine bases and complementary pyrimidine bases  
 B Pyrimidine bases only  
 C Purine bases only  
 D Molecules of deoxyribose and phosphate groups  
 E Nitrogenous bases and phosphate groups
- 27 During which of the following stages of cell cycle DNA replication occurs?**  
 A Early prophase  
 B G1 phase  
 C G2 phase  
 D G0 phase  
 E S phase
- 28 Which of the following statements best describes mitosis?**  
 A It occurs only in the reproductive structure of organism  
 B During this stage DNA is synthesized  
 C It is one of the interphase stages  
 D It is the division of mother cell into two daughter cells, genetically identical to each other and to their parent cell  
 E It is the division of mother cell into two daughter cells, genetically different from each other and from their parent cell
- 29 Gene expression may be regulated:**  
 A Only during translation  
 B Only during transcription  
 C During transcription and translation  
 D Only during replication  
 E During replication and transcription
- 30 One of a series of different versions of gene is called:**  
 A Genome  
 B Haploid  
 C Diploid  
 D Allele  
 E Allosome

- 31 Which of the following processes can decrease the genetic variation in natural populations?**  
 A Recombination  
 B Immigration  
 C Mutagenesis  
 D Inbreeding  
 E Hybridization
- 32 Eutrophication is the process of:**  
 A Vegetation succession in lakes  
 B Nutrient depletion of lakes  
 C Increase inflow of minerals in lakes  
 D Primary succession in lakes  
 E Biological renewal of aquatic ecosystems
- 33 Which of the following types of plants tissue transport water and minerals?**  
 A Phloem  
 B Xylem  
 C Meristem  
 D Vascular cambium  
 E Epidermis
- 34 Which of the following require a host cell because they are notable to make proteins on their own?**  
 A Paramecium caudatum  
 B Escherichia coli  
 C Influenza virus  
 D Saccharomyces cerevisiae  
 E Euglena viridis
- 35 Which of the following is found in an unusual high proportion in cells of cardiac muscle?**  
 A Lysosomes  
 B Mitochondria  
 C mRNA  
 D Golgi apparatus  
 E Cell nucleus
- 36 Which of the following organisms conduct ethanol fermentation?**  
 A Yeasts  
 B Bears  
 C Spiders  
 D Barley  
 E Mushrooms
- 37 Which of the following is the right order of the four stages of food processing?**  
 A Digestion, ingestion, absorption, elimination  
 B Ingestion, digestion, elimination, absorption  
 C Ingestion, digestion, absorption, elimination  
 D Digestion, ingestion, absorption, elimination  
 E Absorption, elimination, digestion, ingestion
- 38 Which hormone is produced by the placenta?**  
 A Progesterone  
 B Insulin  
 C Thyroxin  
 D Melatonin  
 E None of the above
- 39 Which of the following is not characteristic for mammals?**  
 A Mammary glands  
 B Hair  
 C Cold-blooded  
 D Three middle ears bones  
 E Sweat glands
- 40 All of the members of a particular species that live in one area are called a(an):**  
 A Biotope  
 B Community  
 C Ecosystem  
 D Biosphere  
 E Population

- 41 Consider the following inequalities:**
- A  $(2/3) > (3/4)$   
 B  $(2/3) < (2/5)$   
 C  $z^{-1} > z^{-2}$  when  $z$  is real and  $z > 1$   
 D  $2 + \frac{1}{10} > 1 + \frac{11}{10}$   
 E None of the above
- 42 What is the solution of the linear system  $x+y=5$ ;  $2x+3y=4$ ?**
- A  $x=1, y=1$   
 B  $x=11, y=-6$   
 C The linear system has infinite solutions  
 D  $x=-11, y=6$   
 E The linear system has no solution
- 43 What is/are the correct value(s) of  $(a + b)^2$  ( $a, b$  real numbers)?**
- A  $a^2 + ab + b^2$   
 B  $a^2 + b^2$   
 C  $a^2 - b^2$   
 D  $a^2 + 2ab + b^2$   
 E  $a^2 + 2ab + b^2$
- 44 Consider the equation  $4 - \sqrt{7 + \sqrt{9 + \sqrt{4 + x}}} = 0$ . Mark the correct value of  $x$**
- A 3660  
 B 46  
 C 567  
 D 68  
 E 5180
- 45 What is/are the correct value(s) of  $x$  for the equation  $\log_x(16) = \frac{4}{3}$ ?**
- A  $x = \sqrt[3]{65536}$   
 B  $x = 64$   
 C  $x = 2$   
 D  $x = 8$   
 E  $x = 1$
- 46 Calculates the mass of the motorcycle with speeds of 10 m / s and kinetic energy of 10000 J**
- A 100 kg  
 B 300 kg  
 C 200 kg  
 D 400 kg  
 E 500 kg
- 47 Which physical quantity can be measured in Newton meter (N m)?**
- A Force  
 B Momentum  
 C Kinetic energy  
 D Power  
 E Work
- 48 Which physical quantity can be measured in Newton second (N s)?**
- A Force  
 B Momentum  
 C Kinetic energy  
 D Power  
 E Work
- 49 When do you have a uniform circular motion?**
- A When there is a variable centripetal force  
 B When there is a constant centripetal force  
 C When there is a constant centrifugal force  
 D When there is a variable centrifugal force  
 E When there is a constant velocity
- 50 A net force  $F_A$  acts on object A, and a net force  $F_B$  acts on object B. The mass of object B is twice the mass of object A, and the acceleration of object B is twice that of object A. Which of the following relations between  $F_A$  and  $F_B$  is true?**
- A  $F_B = \frac{1}{4} F_A$   
 B  $F_B = \frac{1}{2} F_A$   
 C  $F_B = F_A$   
 D  $F_B = 2 F_A$   
 E  $F_B = 4 F_A$

- 51 In which year the Wright brothers achieved the first powered, sustained and controlled airplane flight?**  
 A 1908  
 B 1918  
 C 1880  
 D 1903  
 E None of the above
- 52 The Machu Picchu is an archeological site located in?**  
 A Perù  
 B Iran  
 C Mexico  
 D Colombia  
 E None of the above
- 53 Which is the Capital of Romania?**  
 A Budapest  
 B Bucarest  
 C Belgrad  
 D Novi Sad  
 E None of the above
- 54 Which architect designed the Sagrada Familia in Barcellona?**  
 A Le Corbusier  
 B Carlos Gardel  
 C Antoni' Gaudi'  
 D Oscar Niemeyer  
 E None of the above
- 55 Who first discovered the oral polio vaccine?**  
 A Fleming  
 B Sabin  
 C Dulbecco  
 D Pasteur  
 E None of the above
- 56 In which year Christopher Columbus discovered America?**  
 A 1592  
 B 1472  
 C 1492  
 E 1542
- 57 Who designed the cupola of Santa Maria del Fiore in Florence?**  
 A Michelangelo  
 B Raffaello  
 C Maderno  
 D Brunelleschi  
 E None of the above
- 58 Which of the following movies was not directed by Stanley Kubrick?**  
 A 2001: A Space Odyssey  
 B Lawrence of Arabia  
 C Shining  
 D A clockwork Orange  
 E None of the above
- 59 Which of the following Nations is not a Republic?**  
 A Portugal  
 B Austria  
 C Greece  
 D Sweden  
 E None of the above
- 60 Roger Federer is:**  
 A Football player  
 B Basketball player  
 C Volleyball player  
 D Tennis player  
 E None of the above