

**THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY**

**[DM 0822]**

**AUGUST 2022**

**Sub. Code :1486**

**D.M. – CRITICAL CARE MEDICINE**

**Paper I – APPLIED BASIC MEDICAL SCIENCES, ANATOMY,  
PHYSIOLOGY, PHARMACOLOGY, BIOCHEMISTRY, MICROBIOLOGY,  
PATHOLOGY AND PHYSICS**

***Q.P. Code: 161486***

**Time: Three Hours**

**Maximum: 100 Marks**

**I. Elaborate on: (2 x 15 = 30)**

1. Outline how the pathophysiological changes in septic shock affect the pharmacokinetics and pharmacodynamics of commonly used antimicrobials.
2. Describe the ventilation perfusion relationships in the upright lung as per the West's zones. Explain the physiological relationships behind the changes.

**II. Write notes on: (10 x 7 = 70)**

1. Describe the principles of capnography, calibration, interpretation of waveforms, sources of error and limitations.
2. Discuss the factors affecting intracranial pressure. Describe the different ways in which this can be measured.
3. Explain resonance and damping in relation to the arterial line system.
4. Outline the changes in pharmacodynamics and pharmacokinetics in a pregnant lady at term.
5. Describe the production and metabolism of lactate. Write a short note on lactate shuttle.
6. Compare and contrast the pharmacology of dobutamine and levosimendan.
7. Describe the pharmacology of vecuronium, including the factors that prolong its neuromuscular blockade.
8. Describe the work of breathing and its components.
9. Regarding randomised clinical trials, explain the following terms:
  - a. External validity.
  - b. Allocation concealment.
  - c. Stratification.
  - d. Sensitivity analysis.
  - e. Fragility Index.
10. Draw a diagram depicting the coagulation cascade and identify the routine tests of coagulation which guide us to diagnose disturbances in this cascade.

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**THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY**

**[DM 0124]**

**JANUARY 2024**

**Sub. Code :1486**

**D.M. – CRITICAL CARE MEDICINE  
PAPER I – APPLIED BASIC MEDICAL SCIENCES, ANATOMY,  
PHYSIOLOGY, PHARMACOLOGY, BIOCHEMISTRY, MICROBIOLOGY,  
PATHOLOGY AND PHYSICS**

*Q.P. Code: 161486*

**Time: Three Hours**

**Maximum: 100 Marks**

**I. Elaborate on: (2 x 15 = 30)**

1. Describe and draw a diagram to represent the various mechanisms of antibiotic resistance. What are important mechanisms of resistance for the following antibiotics?
  - a) Aminoglycosides
  - b) Carbapenems
  - c) Fluoroquinolones.
2. Describe the carbon dioxide carriage in blood including the Haldane effect and Chloride shift. Write a brief note on the double Bohr and double Haldane effect.

**II. Write notes on: (10 x 7 = 70)**

1. Mention the principle on which pulse oximetry is based, its utility in critical care patients and its drawbacks
2. Regarding prolonged intravenous infusions of beta-lactam antibiotics in septic patients:
  - a) Explain the pharmacological rationale for this method of drug delivery.
  - b) List the advantages and disadvantages of this method of drug delivery.
  - c) What is the available evidence for this method of drug delivery?
3. Describe the factors affecting airway resistance and how airway resistance can be measured.
4. Describe the oxygen cascade and the reasons for the cascade with a diagram. Explain how alveolar oxygen tension is calculated.
5. Describe the physiology of cerebrospinal fluid-functions, production, turnover, and circulation.
6. Mention the various factors which maintain sodium and water homeostasis.
7. Volume of distribution: importance in critically ill patients
8. Write short notes on
  - a) Odds ratio
  - b) Intention to treat analysis vs per protocol analysis
9. Discuss the pharmacology of heparin and outline the main differences between low molecular weight heparin and unfractionated heparin.
10. Outline the daily nutritional requirements, including electrolytes, for a 70kg male with a BMI of 22.

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**THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY**

**[DM 0225]**

**FEBRUARY 2025**

**Sub. Code :1486**

**D.M. – CRITICAL CARE MEDICINE**

**PAPER I – APPLIED BASIC MEDICAL SCIENCES, ANATOMY,  
PHYSIOLOGY, PHARMACOLOGY, BIOCHEMISTRY, MICROBIOLOGY,  
PATHOLOGY AND PHYSICS**

*Q.P. Code: 161486*

**Time: Three Hours**

**Maximum: 100 Marks**

**I. Elaborate on:**

**(2 x 15 = 30)**

1. Describe the physiological factors that affect pulmonary arterial pressure. Write short notes on the use of inhaled nitric oxide as a pulmonary vasodilator.
2. Draw a diagram depicting the coagulation cascade and identify the routine tests of coagulation which guide us to diagnose disturbances in this cascade.

**II. Write notes on:**

**(10 x 7 = 70)**

1. Principles in oximetry and the role of co-oximetry in ICU.
2. Role of IVIG (Intravenous Immunoglobulin) in critically ill patients: indications, dose and regimes recommended and adverse effects.
3. Rebalanced hemostasis.
4. Describe the production and metabolism of lactate. Write a short note on lactate shuttle.
5. Describe the cardiovascular changes of pregnancy.
6. Outline the distribution of calcium in normal plasma. Describe the hormonal control of the calcium concentration in the plasma.
7. Outline the changes in pharmacodynamics and pharmacokinetics in a pregnant lady at term.
8. Compare and contrast the pharmacology of adrenaline and milrinone.
9. Zero order kinetics.
10. Methemoglobinemia.

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**D.M. – CRITICAL CARE MEDICINE**

**PAPER I – APPLIED BASIC MEDICAL SCIENCES,  
ANATOMY, PHYSIOLOGY, PHARMACOLOGY, BIOCHEMISTRY,  
MICROBIOLOGY, PATHOLOGY AND PHYSICS**

*Q.P. Code: 161486*

**Time: Three Hours**

**Maximum: 100 Marks**

**I. Elaborate on:** **(2 x 15 = 30)**

1. Discuss the heart lung interactions in a patient on mechanical ventilation. How is this used in the assessment of fluid responsiveness?
2. Describe the cerebral circulation, autoregulation and the factors that affect this.

**II. Write notes on:** **(10 x 7 = 70)**

1. Compare and contrast the pharmacokinetics and side effects of morphine and fentanyl.
2. Revised Starling principle and clinical relevance.
3. Define dead space and its components and explain how this can be estimated physiologically and at the bedside.
4. Pendelluft phenomenon and clinical significance.
5. Describe the pharmacology of vecuronium, including the factors that prolong its neuromuscular blockade.
6. Describe the factors that affect mixed venous oxygen saturation.
7. Nerve conduction studies: basis, indications in ICU patients, interpretation, and utility.
8. Describe the buffer systems in the body.
9. Definition and management of status epilepticus.
10. Heparin induced thrombocytopenia (HIT)-diagnosis and management.

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