*, easiest; ***, hardest

1)** A 2-year-old boy presents with a four-day history of vomiting, fever of 101.4º F, and complaints of “his head hurting bad”, for which he points to 5/5 on a FACES non-verbal pain scale. Kernig and Brudzinski signs are negative, but the neck is mildly stiff. Lumbar puncture shows slightly elevated opening pressure, 1050 leukocytes with 60% lymphocytes, 25% granulocytes and 10% monocytes. CSF glucose is 62; protein = 71. Gram stains reveal no organisms. His parents reported no history of insect or animal bites, and they have not travelled recently.

The diagnosis is:

A. acute flaccid myelitis
B. aseptic meningitis
C. bacterial meningitis
D. listeriosis
E. new variant Creutzfeldt-Jakob disease

2)* The Sabin vaccine is an example of what kind of vaccine?

A. Killed virus
B. Live, attenuated bacterial
C. Live, attenuated virus
D. Recombinant subunit
E. Toxoid

3)** Poliovirus and West Nile virus are similar in that both...

A. are DNA viruses
B. are members of the Picornavirus family
C. are spread by food or water contaminated by sewage
D. cause latent infections in dorsal root ganglia
E. cause severe neurologic sequelae in less than 1% of patients

The following TWO questions refer to the case below.
A 27-year-old man presents to the emergency room with a fever of 102.5º F, rigors, severe headache, nausea and muscle aches. He has no history of previous illness but reports that the previous day he had abnormal movements of his right hand and face. He also has difficulty comprehending speech and has visual hallucinations. He is HIV-negative. On physical exam, he is confused and disoriented, shows papilledema and mild nuchal rigidity. He is Kerning sign positive; MRI shows lesions over the medial temporal lobes. He has no travel history. Results from lumbar puncture are pending.

4)*** The pathogen is most likely...

A. *Cryptococcus neoformans*
B. *Escherichia coli*
C. Herpes simplex virus 1
D. JC polyomavirus
E. *Klebsiella pneumoniae*
F. Toxoplasma
G. West Nile virus

5)** Treatment for his illness should include...

A. acyclovir
B. Erythromycin
C. rabies immune serum
D. symptomatic care only
E. Trimethoprim

6)* A 50-year-old HIV+ man developed hemiplegia, right sided numbness, a slow impairment of memory, and a loss of orientation. He died in an accident and the pathology report noted that there was significant demyelination, and loss of oligodendrocytes. The pathogen causing these changes was...

A. herpes simplex-2 virus
B. JC polyomavirus
C. *Listeria monocytogenes*
D. SARS-CoV2
E. Streptococcus pneumoniae
F. *Toxoplasma gondii*
G. West Nile virus

7)* While on a global health mission in Afghanistan with Doctor Without Borders, you see a 10-year-old boy presents with flaccid paralysis of both legs. His father reports that he had recently been ill with a fever, headache, muscle pains and a stiff neck. He has no vaccination history. Which pathogen is causing his illness?

A. *Borrelia burgdorferi*
B. *Neisseria meningitidis*
C. Poliovirus
D. *Taenia* spp.
E. *Treponema pallidum*
F. West Nile virus

8)* A highly excitable 65-year-old woman presents to the ER with pronounced confusion and disorientation (0/3x). During lumbar puncture she goes into convulsions. Her husband reports that during a trip to Nepal a month ago, she was bitten on the hand by a dog. The bite was washed and bandaged but no further care was received. Her condition deteriorates rapidly, and she becomes comatose and dies within a week. Which of the following is true concerning the disease?

A. Bats are responsible for nearly all human cases of the disease in the US.
B. Extensive hemorrhagic necrosis would be seen in the temporal lobe.
C. Her CSF would be positive for IgM anti-West Nile virus.
D. Human infection is incidental; it primarily kills horses and birds.
E. Numerous vacuolations would be observed in her brain tissue after autopsy.
F. The causative pathogen is a Picornavirus.

9) A 65-year-old woman presents to your clinic with a painful, vesicular rash on her right T4 dermatome for the past 4 days. She tells you that she has had fever, chills, and myalgias for the past two days. Her medical history is significant for hypertension. Physical exam reveals a painful, vesicular rash on the right T4 dermatome with an erythematous base.

Question: Which of the following is the most likely complication of this patient's condition?

A. Bacterial pneumonia
B. *Candida* esophagitis
C. Disseminated herpes simplex infection
D. Herpes zoster ophthalmicus
E. Post-herpetic neuralgia

10) *** A 9-year-old girl is admitted to the pediatric inpatient service with a 3-day history of fever, fatigue, and worsening headache. She lives with her family in northern Arizona and 8 days ago she returned from a three-day camping trip in Cedar Breaks National Monument in southern Utah. A non-engorged tick was noted on her upper chest while on the trip, and the tick was removed without difficulty. She and other family members had multiple mosquito bites. She complains of pain with movement of her neck. On physical examination her vital signs are within normal limits. She is ill-appearing but answers questions. She has photophobia but no focal neurologic symptoms.

She has a **faint erythematous maculopapular rash on her trunk**. There are no petechiae. A complete blood cell (CBC) count was normal. Electrolyte, aspartate aminotransferase, and alanine aminotransferase levels were normal. A lumbar puncture was performed. Cerebrospinal fluid (CSF) glucose level was normal, and **protein level was 72 mg/dL** (**Norm = 30 mg/dL**). CSF cell count was 0 red blood cells and **81 WBC (65% lymphocytes, 10% monocytes, and 25% neutrophils; Norm = 0-5 cells**). CSF Gram-staining showed no organisms. A multiplex PCR assay was negative for bacterial pathogens, cytomegalovirus, enterovirus, parechovirus, HSV, human herpesvirus 6, and VZV.

Which one of the following diagnostic tests is most likely to be positive?

A. CSF and serum West Nile virus IgM antibodies.
B. CSF dengue virus IgM and IgG antibodies.
C. CSF *Rickettsia rickettsii* PCR.
D. CSF West Nile virus RNA PCR.
E. Serum *Anaplasma phagocytophilum* IgM and IgG antibodies.

Answers on next page

1 B

2 C

3 E

4 C

5 A

6 B

7 C

8 A

9 E

10 A **Note:** This is an item type that you're likely to see on Boards and one that forces you to review your Systemic Infections material. The vector seems to be mosquito rather than tick as the latter was not engorged and came off easily. Arizona and Utah* are endemic for WNV, and not for dengue, unless the latter is imported. **Neuro symptoms esp., photophobia point towards viral meningitis and dengue is not usually associated with neuro symptoms**. The CSF analysis points more towards viral etiology and *Rickettsia* and *Anaplasma* can be ruled out. The duration of the disease makes WNV IgM antibodies a better diagnostic marker than RNA PCR.

**In Utah, West Nile Virus (WNV) is a yearly concern, with an average of 12 human cases reported annually according to the Utah Department of Health and Human Services*