Example Questions: Clinical Pathology
Phase II Certifying Examination

These questions illustrate possible question styles and content examples for the Phase II Certifying Examination.
• Helpful information is on the ACVP website, including the Candidate Handbook

• The Phase II Certifying Examination consists of 300 equally weighted multiple-choice questions (3, 4 or 5 choices) administered in 3 sections of 100 questions each:

**Section 1:**
- **Knowledge** - usually only text, can be single images or data tables

**Section 2:**
- **Interpretation** - usually single images or data tables

**Section 3:**
- **Extended integrated interpretation** – usually multiple microscopic or other images and/or data tables

• Unless otherwise informed, assume the stain used for samples in microscopic images are Wright-Giemsa (cytology & hematology) or Hematoxylin & Eosin (histology)

• Questions can be text only or can have single or multiple microscopic or other images and/or data tables.
Example Question 1

Section 1: Knowledge – text only, cytology

1. What is the presence of extracellular myelin-like material in canine cerebrospinal fluid associated with?

   A. Necrosis
   B. Neoplasia
   C. Inflammation
   D. Sampling artifact

Answer: D

Example Question 2

Section 1: Knowledge - text only, hemostasis

2. In cats, prolonged aPTT and normal PT without a bleeding tendency occurs with deficiency of which factor?

   A. Factor IX
   B. Factor XI
   C. Factor VII
   D. Factor XII

Answer: D

Example Question 3
Section 2: Interpretation - single data table, biochemistry

Laboratory data from an African Grey parrot.

<table>
<thead>
<tr>
<th>Test (units)</th>
<th>Patient (Baseline)</th>
<th>Flag (Baseline)</th>
<th>Reference Interval (Baseline)</th>
<th>Patient (at 3 hours of water deprivation)</th>
<th>Patient (post vasopressin administration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium (mmol/L)</td>
<td>159</td>
<td>H</td>
<td>134 - 152</td>
<td>159</td>
<td>-</td>
</tr>
<tr>
<td>Glucose (mmol/L)</td>
<td>13</td>
<td>H</td>
<td>6 - 9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Urine specific gravity</td>
<td>1.003</td>
<td>1.005 - 1.020</td>
<td>1.003</td>
<td>1.020</td>
<td></td>
</tr>
<tr>
<td>Plasma osmolality (mOsmol/kg)</td>
<td>327</td>
<td>H</td>
<td>299 - 313</td>
<td>340</td>
<td>312</td>
</tr>
</tbody>
</table>

Which condition is most likely?

A. Diabetes mellitus  
B. Medullary washout  
C. Psychogenic polydipsia  
D. Central diabetes insipidus

Answer: D
Example Question 4

Section 2: Interpretation - single image, hematology

Cytograms from an Advia hematology analyzer.

What is indicated by the circled regions?

A. Lipemia
B. Hemolysis
C. Lymphocytes
D. Platelet clumps

Answer: A
Example Question 5

Section 2: Interpretation - single image, hematology

Blood smear from a horse.

What is the genus and species of the erythoparasite?

A. *Theileria equi*
B. *Babesia gibsoni*
C. *Neorickettsia risticii*
D. *Anaplasma phagocytophilum*

Answer: A
Example Question 6

Section 2: Interpretation - single image, quality assurance

What is plotted on the x-axis and y-axis, respectively, in this Levey-Jennings plot?

A. Precision and accuracy
B. Speed and assay range
C. Time and concentration
D. Specificity and sensitivity

Answer: C
Example Question 7

Section 2: Interpretation - single image, cytology

Nasal flush (unstained wet mount) from a dog.

Which is the most appropriate interpretation?

A. Pollen inhalation
B. *Eucoleus* infection
C. *Rhinospordinum* infection
D. Oropharyngeal contamination

Answer: B
Example Question 8

Section 2: Interpretation - single image, cytology

Cutaneous mass aspirate from a dog.

Using Masson’s trichrome, the structures indicated by the arrows are expected to stain which color?

A. Red
B. Blue
C. Purple

Answer: B
Example Question 9

Section 3: Extended integrated interpretation - multiple images, cytology and histology

Aspirate and tissue section from an 8 cm intra-abdominal mass in a dog.
Which neoplasm is most likely?

A. Seminoma  
B. Lymphoma  
C. Histiocytic sarcoma  
D. Metastatic carcinoma  
E. Transmissible venereal tumor

Answer: A
Example Question 10

Section 3: Extended integrated interpretation - multiple images and/or data tables, hematology, cytology

Hematologic data, blood smear and lymph node aspirate from a dog with lymphadenomegaly as the only physical abnormality.

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>Patient</th>
<th>Flag</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hct</td>
<td>%</td>
<td>45</td>
<td></td>
<td>37 - 55</td>
</tr>
<tr>
<td>WBC</td>
<td>x 10⁹/L</td>
<td>22.5</td>
<td>H</td>
<td>4.8 - 13.9</td>
</tr>
<tr>
<td>Segmented neutrophils</td>
<td>x 10⁹/L</td>
<td>9.0</td>
<td></td>
<td>2.6 - 10.8</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>x 10⁹/L</td>
<td>7.5</td>
<td>H</td>
<td>0.7 - 3.2</td>
</tr>
<tr>
<td>Monocytes</td>
<td>x 10⁹/L</td>
<td>0.5</td>
<td></td>
<td>0.1 - 1.1</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>x 10⁹/L</td>
<td>0.5</td>
<td></td>
<td>0 - 1.2</td>
</tr>
<tr>
<td>Platelets</td>
<td>x 10⁹/L</td>
<td>325</td>
<td></td>
<td>145 - 463</td>
</tr>
</tbody>
</table>
Which immunophenotypic results are most likely for the cells indicated by the arrows?

A. CD3+, CD4+, CD45-
B. CD3+, CD4-, CD 45+
C. CD3-, CD5+, CD 45-

Answer: A
Example Question 11

Section 3: Extended integrated interpretation - multiple images and/or data tables, cytology

Which flow cytometry scattergram from a canine mediastinal mass fits best with a thymoma?

A.  

B.  

C.  

D.  

Answer:  D
Example Question 12

Section 3: Extended integrated interpretation - multiple images and data tables, hematology

Hematologic data and bone marrow aspirate from an 8-year-old dog with mild lethargy. Images are representative of the granulocytic series throughout the marrow.

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>Patient</th>
<th>Flag</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematocrit</td>
<td>L/L</td>
<td>0.36</td>
<td>L</td>
<td>0.40 – 0.55</td>
</tr>
<tr>
<td>Reticulocytes</td>
<td>x 10⁹/L</td>
<td>25</td>
<td></td>
<td>0 - 85</td>
</tr>
<tr>
<td>WBC</td>
<td>x 10⁹/L</td>
<td>5.8</td>
<td></td>
<td>5.7 - 14.9</td>
</tr>
<tr>
<td>Platelets</td>
<td>x 10⁹/L</td>
<td>305</td>
<td></td>
<td>220 - 490</td>
</tr>
</tbody>
</table>
Which condition is most likely?

A. Myelodysplastic syndrome
B. Inherited Pelger-Huet anomaly
C. Immune-mediated neutrophil maturation arrest
D. Absent granulocyte reserve from acute inflammation

Answer: B
Example Question 13

Section 3: Extended integrated interpretation - multiple data tables, biochemistry

Biochemical and urinalysis data from a 7-year-old castrated male mixed breed dog.

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>Patient</th>
<th>Flag</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>mmol/L</td>
<td>146</td>
<td></td>
<td>141 - 150</td>
</tr>
<tr>
<td>Potassium</td>
<td>mmol/L</td>
<td>2.9</td>
<td>L</td>
<td>3.9 – 5.3</td>
</tr>
<tr>
<td>Chloride</td>
<td>mmol/L</td>
<td>123</td>
<td>H</td>
<td>109 - 119</td>
</tr>
<tr>
<td>Total CO₂</td>
<td>mmol/L</td>
<td>11</td>
<td>L</td>
<td>19 – 30</td>
</tr>
<tr>
<td>Calcium</td>
<td>mg/dL</td>
<td>12.1</td>
<td></td>
<td>9.7 – 12.3</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>mg/dL</td>
<td>1.6</td>
<td>L</td>
<td>2.9 – 6.2</td>
</tr>
<tr>
<td>Urea</td>
<td>mg/dL</td>
<td>25</td>
<td></td>
<td>7 - 32</td>
</tr>
<tr>
<td>Creatinine</td>
<td>mg/dL</td>
<td>1.3</td>
<td></td>
<td>0.5 – 1.5</td>
</tr>
<tr>
<td>Glucose</td>
<td>mg/dL</td>
<td>125</td>
<td></td>
<td>67 - 132</td>
</tr>
<tr>
<td>Total Protein</td>
<td>g/dL</td>
<td>5.3</td>
<td></td>
<td>4.8 – 6.9</td>
</tr>
</tbody>
</table>
Which is the most likely diagnosis?

A. Hyporeninemic hypoaldosteronism  
B. Distal (Type 1) renal tubular acidosis  
C. Proximal (Type 2) renal tubular acidosis  
D. Syndrome of inappropriate ADH secretion

Answer: B
Example Question 14

Section 3: Extended integrated interpretation - multiple data tables, biochemistry

Biochemical and urinalysis data from a 10-year-old spayed female Beagle dog. Aside from being thin and having mild periodontal disease, there are no physical examination abnormalities. The CBC is unremarkable.

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>Patient</th>
<th>Flag</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>mmol/L</td>
<td>147</td>
<td></td>
<td>141 - 150</td>
</tr>
<tr>
<td>Potassium</td>
<td>mmol/L</td>
<td>4.2</td>
<td></td>
<td>3.9 – 5.3</td>
</tr>
<tr>
<td>Chloride</td>
<td>mmol/L</td>
<td>117</td>
<td></td>
<td>109 - 119</td>
</tr>
<tr>
<td>Total CO₂</td>
<td>mmol/L</td>
<td>6</td>
<td>L</td>
<td>19 – 30</td>
</tr>
<tr>
<td>Calcium</td>
<td>mg/dL</td>
<td>9.8</td>
<td></td>
<td>9.7 – 12.3</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>mg/dL</td>
<td>15.0</td>
<td>H</td>
<td>2.2 – 7.9</td>
</tr>
<tr>
<td>Urea</td>
<td>mg/dL</td>
<td>110</td>
<td>H</td>
<td>7 - 32</td>
</tr>
<tr>
<td>Creatinine</td>
<td>mg/dL</td>
<td>4.6</td>
<td>H</td>
<td>0.5 – 1.5</td>
</tr>
<tr>
<td>Glucose</td>
<td>mg/dL</td>
<td>161</td>
<td>H</td>
<td>67 - 132</td>
</tr>
<tr>
<td>Total Protein</td>
<td>g/dL</td>
<td>6.6</td>
<td></td>
<td>4.8 – 6.9</td>
</tr>
<tr>
<td>Albumin</td>
<td>g/dL</td>
<td>1.7</td>
<td>L</td>
<td>2.3 – 3.9</td>
</tr>
<tr>
<td>Globulin</td>
<td>g/dL</td>
<td>4.9</td>
<td>H</td>
<td>2.2 – 3.5</td>
</tr>
<tr>
<td>CK</td>
<td>U/L</td>
<td>423</td>
<td></td>
<td>22 - 491</td>
</tr>
<tr>
<td>AST</td>
<td>U/L</td>
<td>51</td>
<td></td>
<td>21 - 53</td>
</tr>
<tr>
<td>ALT</td>
<td>U/L</td>
<td>601</td>
<td>H</td>
<td>14 – 87</td>
</tr>
<tr>
<td>SDH</td>
<td>U/L</td>
<td>36</td>
<td>H</td>
<td>0 - 12</td>
</tr>
<tr>
<td>ALP</td>
<td>U/L</td>
<td>433</td>
<td>H</td>
<td>20 – 157</td>
</tr>
<tr>
<td>GGT</td>
<td>U/L</td>
<td>22</td>
<td>H</td>
<td>5 – 16</td>
</tr>
<tr>
<td>Total bilirubin</td>
<td>mg/dL</td>
<td>0.9</td>
<td>H</td>
<td>0.1 – 0.8</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>mg/dL</td>
<td>422</td>
<td>H</td>
<td>149 - 319</td>
</tr>
<tr>
<td><strong>Urinalysis</strong></td>
<td><strong>Patient</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection timing</td>
<td>Concurrent to blood collection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection method</td>
<td>Cystocentesis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarity</td>
<td>Clear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reagent Strip</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>3+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ketones</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilirubin</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sediment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC (per 400x field)</td>
<td>3 - 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBC (per 400x field)</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epithelial cells (per 400x field)</td>
<td>1 - 3 transitional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casts (per 100x field)</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crystals</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Which interpretation is appropriate for the acid-base data and renal concentrating ability?

<table>
<thead>
<tr>
<th>Acid base</th>
<th>Renal concentrating ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Secretional metabolic acidosis</td>
<td>Inadequate</td>
</tr>
<tr>
<td>B Titrational metabolite acidosis</td>
<td>Inadequate</td>
</tr>
<tr>
<td>C Secretional metabolic acidosis</td>
<td>Adequate</td>
</tr>
<tr>
<td>D Titrational metabolite acidosis</td>
<td>Adequate</td>
</tr>
</tbody>
</table>

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

Answer: B

Another question that could be asked for the same history, signalment, and data:

The proteinuria is most likely attributable to which process?

A. Pre-renal cause  
B. Tubular disease  
C. Post-renal cause  
D. Glomerular disease

Answer: D
Laboratory data and aspirates of spleen and liver from a 9-year-old male castrated Siamese cat with lethargy, weight loss and hepatosplenomegaly.

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>Patient</th>
<th>Flag</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hematology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBC</td>
<td>x 10⁶/uL</td>
<td>4.3</td>
<td>L</td>
<td>6.5 - 12.2</td>
</tr>
<tr>
<td>Hct</td>
<td>%</td>
<td>24</td>
<td>L</td>
<td>30 - 52</td>
</tr>
<tr>
<td>Reticulocytes</td>
<td>x 10³/uL</td>
<td>10</td>
<td></td>
<td>3.0 - 50</td>
</tr>
<tr>
<td>WBC</td>
<td>x 10³/uL</td>
<td>5.1</td>
<td></td>
<td>2.9 - 17.0</td>
</tr>
<tr>
<td>Segmented neutrophils</td>
<td>x 10³/uL</td>
<td>2.0</td>
<td>L</td>
<td>2.3 - 10.3</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>x 10³/uL</td>
<td>2.6</td>
<td></td>
<td>0.9 - 6.8</td>
</tr>
<tr>
<td>Monocytes</td>
<td>x 10³/uL</td>
<td>0.5</td>
<td></td>
<td>0.0 - 0.6</td>
</tr>
<tr>
<td>Platelets</td>
<td>x 10³/uL</td>
<td>58</td>
<td>L</td>
<td>200 - 900</td>
</tr>
<tr>
<td><strong>Serum biochemistry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>mg/dL</td>
<td>24</td>
<td></td>
<td>16 - 37</td>
</tr>
<tr>
<td>Creatinine</td>
<td>mg/dL</td>
<td>1.7</td>
<td></td>
<td>0.9 - 2.3</td>
</tr>
<tr>
<td>Glucose</td>
<td>mg/dL</td>
<td>137</td>
<td></td>
<td>72 - 175</td>
</tr>
<tr>
<td>Total protein</td>
<td>g/dL</td>
<td>11.5</td>
<td>H</td>
<td>6.3 - 8.8</td>
</tr>
<tr>
<td>Albumin</td>
<td>g/dL</td>
<td>2.0</td>
<td>L</td>
<td>2.3 - 3.9</td>
</tr>
<tr>
<td>Globulin</td>
<td>g/dL</td>
<td>9.5</td>
<td>H</td>
<td>3.0 - 5.9</td>
</tr>
</tbody>
</table>
Which paired serum protein electrophoreogram and immunofixation electrophoresis result is most likely?

A. A
B. B
C. C

Answer: B
Hematologic and biochemical data, hepatic aspirate and hepatic tissue section from an adult dog with lethargy, inappetence and weight loss.

<table>
<thead>
<tr>
<th>Test</th>
<th>Units</th>
<th>Patient</th>
<th>Flag</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hct</td>
<td>%</td>
<td>33</td>
<td>L</td>
<td>37 - 55</td>
</tr>
<tr>
<td>Reticulocytes</td>
<td>x 10⁹/L</td>
<td>25</td>
<td></td>
<td>0 - 80</td>
</tr>
<tr>
<td>WBC</td>
<td>x 10⁹/L</td>
<td>20.0</td>
<td>H</td>
<td>4.8 - 13.9</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>x 10⁹/L</td>
<td>17.0</td>
<td>H</td>
<td>2.6 - 10.8</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>x 10⁹/L</td>
<td>0.3</td>
<td>L</td>
<td>0.7 - 3.2</td>
</tr>
<tr>
<td>Monocytes</td>
<td>x 10⁹/L</td>
<td>2.7</td>
<td>H</td>
<td>0.1 - 1.1</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>x 10⁹/L</td>
<td>0</td>
<td></td>
<td>0.0 - 1.2</td>
</tr>
<tr>
<td>Platelets</td>
<td>x 10¹²/L</td>
<td>147</td>
<td></td>
<td>145 - 465</td>
</tr>
<tr>
<td>ALT</td>
<td>U/L</td>
<td>520</td>
<td>H</td>
<td>10 - 55</td>
</tr>
<tr>
<td>ALP</td>
<td>U/L</td>
<td>355</td>
<td>H</td>
<td>15 - 120</td>
</tr>
<tr>
<td>Bile acids (fasted)</td>
<td>µmol/L</td>
<td>41</td>
<td>H</td>
<td>&lt;13</td>
</tr>
<tr>
<td>Bile acids (post-prandial)</td>
<td>µmol/L</td>
<td>184</td>
<td>H</td>
<td>&lt;25</td>
</tr>
</tbody>
</table>
Which disease is most likely?

A. Copper toxicity
B. Hemochromatosis
C. Cholangiohepatitis
D. Hyperadrenocorticism

Answer: A
Example Question 17

Section 3: Extended integrated interpretation - multiple images and/or data tables, cytology

Aspirate and immunohistochemical panel from a 2 cm cutaneous mass on the pinna of an adult dog.
Which neoplasm is most strongly supported?

A. Histiocytoma  
B. T cell lymphoma  
C. Plasma cell tumor  
D. Amelanotic melanoma

Answer: **C**