SAQ 10

A 23 year old male with a decreased level of consciousness is being assessed in your ED. His arterial blood gas results with reference ranges are:

			Reference Range
FIO_2	0.3		
pH	6.9		(7.35-7.45)
pCO_2	10	mmHg	(37-45)
pO_2	147	mmHg	(80-95)
Bicarbonate	2	mmol/L	(22-28)
Base excess	-30		(-3 - +3)
O_2 saturation	98	%	(> 95)
Lactate	7.1	mmol/L	(< 1.3)
Na^+	140	mmol/L	(134-146)
K^+	6.0	mmol/L	(3.4-5.0)
Cl^-	105	mmol/L	(98-106)
Creatinine	0.1	mmol/L	(0.06–0.12)
Urea	4.8	mmol/L	(3.0-8.0)
Glucose	5.2	mmol/L	(3.5-5.5)
Osmolality	360	mOsm/L	(275–295)

a. **List 4 key abnormalities on this patient's gas (4 Marks)**

- *Severe metabolic acidaemia*
- *Expected compensatory respiratory alkalosis / hypocarbia*
- *Severe lactic acidosis*
- *Mild hyperkalaemia or adjusted normal K^+- Adjusted K 3.5 mmol/L for pH decrease of 0.5*
- *Raised osmolarity*
- *Raised A-a gradient - pAO_2 is 201.4 giving A-a gradient of 54.4*
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b. Calculate the patient's anion gap and write the formula used (2 Marks)

Formula: $[Na^+] - ([Cl^-] + [HCO_3^-])$
Calculation: 140 - (105 + 2) = 33
        or
Formula: $[Na^+ + K^+] - ([Cl^-] + [HCO_3^-])$
Calculation: (140+6) - (105 + 2) = 39

c. Calculate the patient's osmolar gap and write the formulas used (3 Marks)

1 Mark for formula and 2 mark for correct calculation components

> *Osmolar gap = measured osmolarity - calculated osmolarity*
> *Calculated osmolarity = 2x [Na$^+$] + [Glucose] + [Urea]*
> *Calculation: 360 - ((2 x 140) + 5.2 + 4.8) = 70*

d. List 6 causes for a raised osmolar gap (6 Marks)

- *Toxic alcohol ingestion*
- *Ethanol ingestion*
- *Diabetic ketoacidosis*
- *Alcoholic ketoacidosis*
- *Mannitol*
- *Severe lactic acidosis*
- *Hyperproteinaemia*
- *Hyperlipidaemia*
- *Chronic renal failure*
- *Shock*
- *Trauma*
- *Burns*
- *Massive hyper-ionaemia Mg^{2+}, Ca^{2+}, PO$_4^-$)*