#4

Nedenfor er 4 overordnet spørgsmål Q1, Q2, Q3 og Q4.
De 4 spørgsmål er et udgangspunkt for det du skal tale om til eksamen. Husk at holde relevante browser vinduer åbne.

Q1) I forbindelse med proteiner bruges følgende termer – hvad betyder de:
Primary protein structure
Secondary protein structure
Tertiary protein structure
Quaternary protein structure

Nævn nogle sekundær struktur elementer

Q2) Proteiner inddeles ofte i nogle klasses, hvoraf en af dem er 'all-beta' (all-β)
Nævn de andre klasser.

Q3) Myoglobin var det første protein som man i 1958 bestemte den 3-dimensionelle struktur af. Fasta sekvensen (MYG_HUMAN) er vist nedenfor:

```
>MYG_HUMAN Myoglobin
MGLSDGEWQLVLNVWGKVEADIPGHGQEVLIRLFKGHPETLEKFDKFKHLKSEDEMKASE
DLKKHGATVLTALGGILKKKGHHEAEIKPLAQSHATKHKIPVKYLEFISECIIQVLQSKH
PGDFGADAQGAMNKALELFRKDMASNYKELGFQG
```

I Q2 nævner du nogle protein klasser. I hvilken klasse skal Myoglobin ?
Til dette skal du benytte de 3 sider output fra NetSurfP (http://www.cbs.dtu.dk/services/NetSurfP/)
som er vist i **Appendix A.**

Q4) Den del af NetSurfP som forudsiger sekundær strukturen for de enkelte aminosyrer har 3 output kategorier H, E og C

Tegn et neuralt netværk med 3 output neuroner.

Appendix A

```
# Column 1: Class assignment - B for buried or E for Exposed - Threshold: 25%
exposure, but not based on RSA
# Column 2: Amino acid
# Column 3: Sequence name
# Column 4: Amino acid number
# Column 5: Relative Surface Accessibility - RSA
# Column 6: Absolute Surface Accessibility
# Column 7: Z-fit score
# Column 8: Probability for Alpha-Helix
# Column 9: Probability for Beta-strand
# Column 10: Probability for Coil
```

E	M	MYG_HUMAN	1	0.612	122.421	-1.620	0.003	0.003	0.994
E	G	MYG_HUMAN	2	0.537	42.270	-0.352	0.018	0.019	0.964
B	L	MYG_HUMAN	3	0.166	30.303	-0.491	0.005	0.015	0.979
E	S	MYG_HUMAN	4	0.423	49.540	1.549	0.016	0.005	0.979
E	D	MYG_HUMAN	5	0.668	96.331	1.149	0.970	0.001	0.030
E	G	MYG_HUMAN	6	0.710	55.908	1.733	0.970	0.001	0.030
B	E	MYG_HUMAN	7	0.079	13.854	0.289	0.923	0.002	0.076
B	W	MYG_HUMAN	8	0.203	48.725	2.057	0.970	0.001	0.030
E	Q	MYG_HUMAN	9	0.592	105.731	1.897	0.988	0.000	0.012
B	L	MYG_HUMAN	10	0.209	38.195	2.379	0.988	0.000	0.012
B	V	MYG_HUMAN	11	0.014	2.106	1.793	0.988	0.000	0.012
E	L	MYG_HUMAN	12	0.381	69.834	2.377	0.988	0.000	0.012
E	N	MYG_HUMAN	13	0.582	85.205	1.916	0.988	0.000	0.012
B	V	MYG_HUMAN	14	0.062	9.591	0.833	0.970	0.001	0.030
B	W	MYG_HUMAN	15	0.057	13.733	1.129	0.988	0.000	0.012
E	G	MYG_HUMAN	16	0.576	45.315	2.076	0.970	0.001	0.030
E	K	MYG_HUMAN	17	0.390	80.285	2.139	0.923	0.002	0.076
B	V	MYG_HUMAN	18	0.036	5.456	-0.173	0.858	0.002	0.139
E	E	MYG_HUMAN	19	0.335	58.594	0.998	0.782	0.003	0.216
E	A	MYG_HUMAN	20	0.746	82.220	1.421	0.600	0.003	0.397
E	D	MYG_HUMAN	21	0.466	67.151	0.268	0.246	0.004	0.750
B	I	MYG_HUMAN	22	0.161	29.859	0.209	0.600	0.003	0.397
E	P	MYG_HUMAN	23	0.551	78.116	0.152	0.782	0.003	0.216
E	G	MYG_HUMAN	24	0.508	40.003	1.726	0.938	0.007	0.055
B	H	MYG_HUMAN	25	0.068	12.424	0.958	0.975	0.003	0.022
B	G	MYG_HUMAN	26	0.029	2.306	0.339	0.970	0.001	0.030
E	Q	MYG_HUMAN	27	0.254	45.364	1.086	0.988	0.000	0.012
E	E	MYG_HUMAN	28	0.354	61.774	1.694	0.988	0.000	0.012
B	V	MYG_HUMAN	29	0.032	4.934	0.881	0.988	0.000	0.012
B	L	MYG_HUMAN	30	0.035	6.372	0.439	0.988	0.000	0.012
E	I	MYG_HUMAN	31	0.267	49.377	1.291	0.988	0.000	0.012
B	R	MYG_HUMAN	32	0.267	61.097	1.282	0.988	0.000	0.012
B	L	MYG_HUMAN	33	0.040	7.306	1.023	0.970	0.001	0.030
B	F	MYG_HUMAN	34	0.052	10.477	0.993	0.923	0.002	0.076
E	K	MYG_HUMAN	35	0.513	105.462	0.985	0.879	0.010	0.111
E	G	MYG_HUMAN	36	0.387	30.488	0.818	0.717	0.014	0.269
B	H	MYG_HUMAN	37	0.124	22.519	1.381	0.109	0.005	0.886
E	P	MYG_HUMAN	38	0.433	61.372	-0.051	0.406	0.004	0.590
E	E	MYG_HUMAN	39	0.568	99.299	0.686	0.622	0.015	0.363
B	T	MYG_HUMAN	40	0.060	8.377	0.396	0.802	0.014	0.185
E	L	MYG_HUMAN	41	0.276	50.554	1.302	0.802	0.014	0.185
E	E	MYG_HUMAN	42	0.662	115.704	0.984	0.717	0.014	0.269

B	K	MYG_HUMAN	43	0.200	41.099	0.958	0.717	0.014	0.269
B	F	MYG_HUMAN	44	0.034	6.864	-0.076	0.502	0.002	0.495
E	D	MYG_HUMAN	45	0.572	82.411	0.827	0.406	0.004	0.590
E	K	MYG_HUMAN	46	0.469	96.473	-0.145	0.406	0.004	0.590
B	F	MYG_HUMAN	47	0.180	36.106	-0.776	0.321	0.003	0.675
E	K	MYG_HUMAN	48	0.485	99.826	-1.225	0.176	0.004	0.820
E	H	MYG_HUMAN	49	0.592	107.721	-1.330	0.058	0.017	0.925
E	L	MYG_HUMAN	50	0.315	57.731	-0.979	0.115	0.016	0.868
E	K	MYG_HUMAN	51	0.583	119.861	-1.789	0.115	0.016	0.868
E	S	MYG_HUMAN	52	0.392	45.931	-0.821	0.181	0.016	0.803
E	E	MYG_HUMAN	53	0.452	78.982	-1.479	0.430	0.016	0.555
E	D	MYG_HUMAN	54	0.591	85.206	-1.272	0.430	0.016	0.555
E	E	MYG_HUMAN	55	0.342	59.765	-0.988	0.430	0.016	0.555
E	M	MYG_HUMAN	56	0.326	65.153	-0.790	0.339	0.016	0.645
E	K	MYG_HUMAN	57	0.537	110.481	-1.085	0.181	0.016	0.803
E	A	MYG_HUMAN	58	0.545	60.070	-1.567	0.058	0.017	0.925
B	S	MYG_HUMAN	59	0.261	30.542	-0.818	0.058	0.017	0.925
E	E	MYG_HUMAN	60	0.584	102.060	-0.327	0.858	0.002	0.139
E	D	MYG_HUMAN	61	0.489	70.436	1.013	0.923	0.002	0.076
B	L	MYG_HUMAN	62	0.066	11.993	0.117	0.970	0.001	0.030
B	K	MYG_HUMAN	63	0.250	51.343	0.781	0.970	0.001	0.030
E	K	MYG_HUMAN	64	0.406	83.535	0.729	0.988	0.000	0.012
B	H	MYG_HUMAN	65	0.075	13.588	0.443	0.970	0.001	0.030
B	G	MYG_HUMAN	66	0.035	2.723	-1.166	0.970	0.001	0.030
E	A	MYG_HUMAN	67	0.291	32.024	1.019	0.988	0.000	0.012
B	T	MYG_HUMAN	68	0.258	35.757	1.458	0.988	0.000	0.012
B	V	MYG_HUMAN	69	0.036	5.456	0.312	0.988	0.000	0.012
B	L	MYG_HUMAN	70	0.053	9.741	-0.061	0.988	0.000	0.012
E	T	MYG_HUMAN	71	0.295	40.972	0.512	0.988	0.000	0.012
B	A	MYG_HUMAN	72	0.074	8.122	0.286	0.988	0.000	0.012
B	L	MYG_HUMAN	73	0.046	8.404	0.386	0.988	0.000	0.012
B	G	MYG_HUMAN	74	0.170	13.363	-0.042	0.988	0.000	0.012
E	G	MYG_HUMAN	75	0.365	28.765	1.128	0.970	0.001	0.030
B	I	MYG_HUMAN	76	0.055	10.231	0.581	0.970	0.001	0.030
B	L	MYG_HUMAN	77	0.037	6.720	-0.432	0.923	0.002	0.076
E	K	MYG_HUMAN	78	0.577	118.627	1.662	0.782	0.003	0.216
E	K	MYG_HUMAN	79	0.325	66.770	0.949	0.502	0.002	0.495
B	K	MYG_HUMAN	80	0.098	20.159	0.337	0.406	0.004	0.590
E	G	MYG_HUMAN	81	0.631	49.691	0.177	0.176	0.004	0.820
E	H	MYG_HUMAN	82	0.498	90.513	1.100	0.176	0.004	0.820
B	H	MYG_HUMAN	83	0.076	13.861	0.469	0.782	0.003	0.216
E	E	MYG_HUMAN	84	0.504	88.101	1.245	0.923	0.002	0.076
E	A	MYG_HUMAN	85	0.532	58.615	1.421	0.970	0.001	0.030
B	E	MYG_HUMAN	86	0.099	17.278	1.287	0.970	0.001	0.030
B	I	MYG_HUMAN	87	0.029	5.402	0.622	0.970	0.001	0.030
E	K	MYG_HUMAN	88	0.447	91.927	2.187	0.970	0.001	0.030
E	P	MYG_HUMAN	89	0.446	63.231	2.224	0.970	0.001	0.030
B	L	MYG_HUMAN	90	0.028	5.054	0.863	0.970	0.001	0.030
B	A	MYG_HUMAN	91	0.042	4.584	-0.130	0.970	0.001	0.030
E	Q	MYG_HUMAN	92	0.578	103.267	1.912	0.923	0.002	0.076
E	S	MYG_HUMAN	93	0.389	45.532	2.016	0.858	0.002	0.139
B	H	MYG_HUMAN	94	0.065	11.860	0.452	0.858	0.002	0.139
B	A	MYG_HUMAN	95	0.238	26.184	0.139	0.694	0.003	0.303
E	T	MYG_HUMAN	96	0.638	88.477	0.400	0.694	0.003	0.303
E	K	MYG_HUMAN	97	0.595	122.350	0.607	0.522	0.016	0.462
E	H	MYG_HUMAN	98	0.283	51.532	0.547	0.113	0.043	0.844
E	K	MYG_HUMAN	99	0.701	144.175	0.463	0.018	0.019	0.964
B	I	MYG_HUMAN	100	0.049	9.084	-0.007	0.018	0.019	0.964

E	P	MYG_HUMAN	101	0.415	58.945	1.517	0.018	0.019	0.964
E	V	MYG_HUMAN	102	0.455	69.857	-0.162	0.522	0.016	0.462
E	K	MYG_HUMAN	103	0.563	115.891	0.335	0.660	0.049	0.291
B	Y	MYG_HUMAN	104	0.148	31.606	0.993	0.751	0.050	0.199
B	L	MYG_HUMAN	105	0.049	8.990	0.699	0.938	0.007	0.055
E	E	MYG_HUMAN	106	0.383	66.893	1.263	0.975	0.003	0.022
B	F	MYG_HUMAN	107	0.199	39.979	1.081	0.970	0.001	0.030
B	I	MYG_HUMAN	108	0.021	3.959	0.544	0.970	0.001	0.030
B	S	MYG_HUMAN	109	0.137	16.056	0.532	0.988	0.000	0.012
E	E	MYG_HUMAN	110	0.414	72.308	0.484	0.988	0.000	0.012
B	C	MYG_HUMAN	111	0.059	8.354	0.904	0.988	0.000	0.012
B	I	MYG_HUMAN	112	0.024	4.385	1.096	0.988	0.000	0.012
B	I	MYG_HUMAN	113	0.153	28.324	0.973	0.988	0.000	0.012
E	Q	MYG_HUMAN	114	0.279	49.865	1.274	0.988	0.000	0.012
B	V	MYG_HUMAN	115	0.048	7.378	0.405	0.988	0.000	0.012
B	L	MYG_HUMAN	116	0.029	5.218	0.925	0.988	0.000	0.012
E	Q	MYG_HUMAN	117	0.324	57.795	1.215	0.970	0.001	0.030
E	S	MYG_HUMAN	118	0.618	72.441	1.119	0.923	0.002	0.076
E	K	MYG_HUMAN	119	0.256	52.577	0.835	0.782	0.003	0.216
B	H	MYG_HUMAN	120	0.112	20.427	0.735	0.406	0.004	0.590
E	P	MYG_HUMAN	121	0.531	75.406	0.595	0.176	0.004	0.820
E	G	MYG_HUMAN	122	0.764	60.166	0.486	0.109	0.005	0.886
E	D	MYG_HUMAN	123	0.576	83.002	-0.046	0.176	0.004	0.820
B	F	MYG_HUMAN	124	0.081	16.196	0.538	0.058	0.017	0.925
E	G	MYG_HUMAN	125	0.338	26.640	1.242	0.018	0.019	0.964
E	A	MYG_HUMAN	126	0.591	65.106	0.398	0.923	0.002	0.076
E	D	MYG_HUMAN	127	0.507	72.987	0.800	0.970	0.001	0.030
B	A	MYG_HUMAN	128	0.053	5.863	1.128	0.970	0.001	0.030
B	Q	MYG_HUMAN	129	0.234	41.721	1.709	0.970	0.001	0.030
E	G	MYG_HUMAN	130	0.464	36.556	1.498	0.970	0.001	0.030
B	A	MYG_HUMAN	131	0.030	3.306	0.557	0.970	0.001	0.030
B	M	MYG_HUMAN	132	0.038	7.504	0.484	0.970	0.001	0.030
E	N	MYG_HUMAN	133	0.350	51.255	1.880	0.970	0.001	0.030
E	K	MYG_HUMAN	134	0.398	81.786	1.880	0.970	0.001	0.030
B	A	MYG_HUMAN	135	0.032	3.537	0.440	0.970	0.001	0.030
B	L	MYG_HUMAN	136	0.082	15.069	1.162	0.988	0.000	0.012
E	E	MYG_HUMAN	137	0.332	58.053	1.241	0.970	0.001	0.030
B	L	MYG_HUMAN	138	0.180	32.940	1.480	0.970	0.001	0.030
B	F	MYG_HUMAN	139	0.029	5.780	0.855	0.970	0.001	0.030
B	R	MYG_HUMAN	140	0.057	13.099	0.840	0.970	0.001	0.030
E	K	MYG_HUMAN	141	0.411	84.481	1.296	0.988	0.000	0.012
B	D	MYG_HUMAN	142	0.106	15.260	1.117	0.988	0.000	0.012
B	M	MYG_HUMAN	143	0.037	7.444	0.145	0.988	0.000	0.012
B	A	MYG_HUMAN	144	0.187	20.585	1.047	0.970	0.001	0.030
E	S	MYG_HUMAN	145	0.584	68.410	1.240	0.970	0.001	0.030
B	N	MYG_HUMAN	146	0.256	37.508	1.307	0.970	0.001	0.030
B	Y	MYG_HUMAN	147	0.112	23.999	0.638	0.923	0.002	0.076
E	K	MYG_HUMAN	148	0.579	119.183	1.194	0.858	0.002	0.139
E	E	MYG_HUMAN	149	0.758	132.353	1.120	0.694	0.003	0.303
E	L	MYG_HUMAN	150	0.415	76.005	0.407	0.246	0.004	0.750
E	G	MYG_HUMAN	151	0.559	43.954	-0.922	0.053	0.005	0.942
B	F	MYG_HUMAN	152	0.194	38.996	-0.802	0.058	0.017	0.925
E	Q	MYG_HUMAN	153	0.697	124.395	0.868	0.058	0.017	0.925
E	G	MYG_HUMAN	154	0.890	70.059	-1.690	0.003	0.003	0.994