Atmospheric and Oceanic Sciences (XE-H)

Question Number : 144 **Correct : 1 Wrong : -0.33**

Rossby Number is the ratio of

(A) Coriolis Force to Inertial Force
(B) Inertial Force to Coriolis Force
(C) Gravitational Force to Coriolis Force
(D) Viscous Force to Inertial Force

Question Number : 145 **Correct : 1 Wrong : -0.33**

Kuroshio Current and Gulf Stream are

(A) EBC, WBC (B) EBC, EBC (C) WBC, WBC (D) WBC, EBC

[WBC: Western Boundary Current, EBC: Eastern Boundary Current]

Question Number : 146 **Correct : 1 Wrong : 0**

The velocity of a tsunami wave in an ocean basin of depth 1 km is _____ $m\ s^{-1}$

[Density of seawater: 1025 $kg\ m^{-3}$, g: 10 $m\ s^{-2}$]

Question Number : 147 **Correct : 1 Wrong : -0.33**

A thin iceberg is observed to move southeastward in the Arctic Ocean. If the surface current is wind driven, the prevailing wind is

(A) Easterly (B) Northerly (C) Southerly (D) Westerly

Question Number : 148 **Correct : 1 Wrong : -0.33**

Equatorial Kelvin and Rossby waves respectively propagate

(A) Westward and Eastward
(B) Eastward and Westward
(C) Westward and Westward
(D) Eastward and Eastward

Question Number : 149 **Correct : 1 Wrong : -0.33**

The largest contributor to the atmospheric greenhouse effect is

(A) CO_2 (B) N_2 (C) CH_4 (D) H_2O

Question Number : 150 **Correct : 1 Wrong : -0.33**

If T_v, T, T_w and T_d denote virtual, dry bulb, wet bulb and dew point temperatures of a moist air parcel, then the correct order of their values is

(A) $T_v > T > T_w > T_d$
(B) $T_v \geq T \geq T_w \geq T_d$
(C) $T_v > T \geq T_w \geq T_d$
(D) $T > T_v > T_w > T_d$

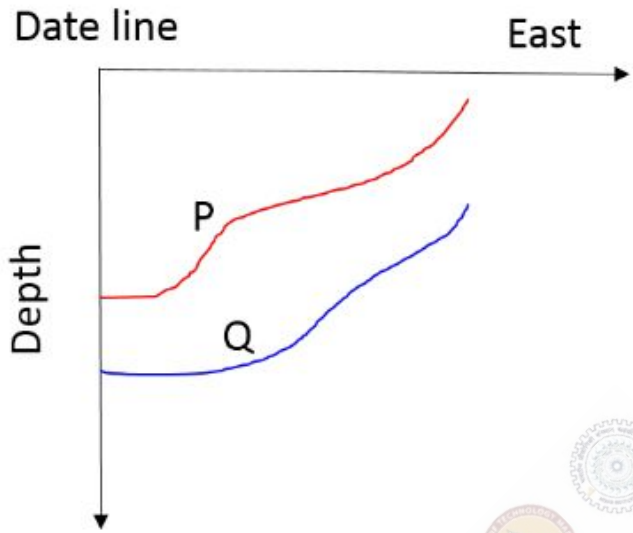
Question Number : 151 **Correct : 1 Wrong : -0.33**

Burning of fossil fuel is increasing the concentration of CO_2 in the atmosphere. A consequence of this is

(A) Ocean water which is presently basic will drift towards pH neutral
(B) Ocean water which is presently acidic will become more acidic
(C) No effect on ocean pH
(D) Ocean water which is presently slightly basic will become more basic

Question Number : 152 Correct : 1 Wrong : -0.33

Mixed layer depths measured in the Pacific Ocean in two different years are schematically shown in the figure below.



Years P and Q belong to

(A) P: El-Nino, Q: La-Nina
(B) P: La-Nina, Q:El-Nino
(C) P: El-Nino, Q: QBO
(D) P: QBO, Q: La-Nina

Question Number : 153 Correct : 2 Wrong : 0

Average surface temperatures of the Sun and the Earth are 6300 K and 285 K, respectively. The ratio of the wavelength of peak radiation of the Earth to that of the Sun is _____.

Question Number : 154 Correct : 2 Wrong : 0

In the month of April, the mixed layer in the Arabian Sea received a net heat flux of 50 W m^{-2}. If the mixed layer depth is 50 m, the increase in temperature at the end of April is _____ °C.

[Density of seawater: 1025 kg m^{-3}, Density of freshwater: 1000 kg m^{-3}, Specific heat of seawater: 4200 J kg^{-1} K^{-1}, Latent heat of evaporation: 2.45×10^6 J kg^{-1}]

Question Number : 155 Correct : 2 Wrong : 0

The thickness of an atmospheric layer between 600 hPa and 500 hPa is 1.5 km. If the layer is isothermal, then its temperature is_____ K.

[Gas constant of air: 287 J kg^{-1} K^{-1}, g: 10 m s^{-2}]

Question Number : 156 Correct : 2 Wrong : -0.66

At 17°N, a mass of fluid is moving under geostrophic balance at 0.3 m s^{-1} towards east. Suddenly the pressure gradient force becomes zero. Then the fluid will

(A) continue to move towards the east at 0.3 m s^{-1}
(B) undergo circular motion with radius of about 17 km
(C) undergo circular motion with radius of about 7 km
(D) move southward

[Angular velocity of the Earth: 7.27×10^{-5} rad s^{-1}]

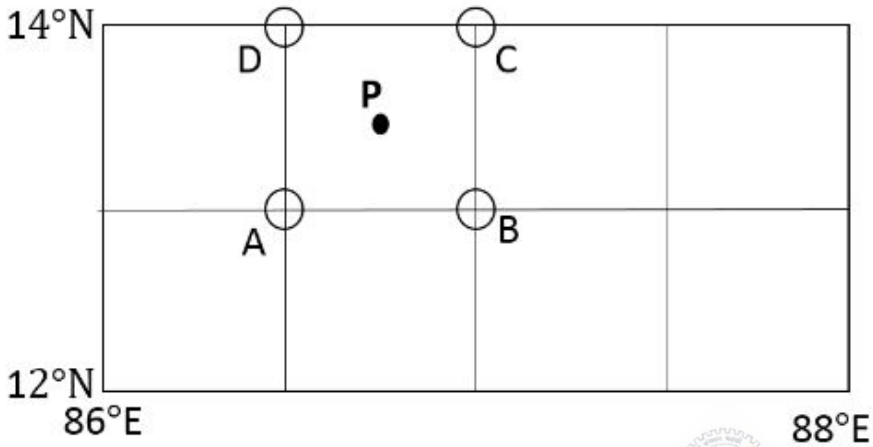
Question Number : 157 Correct : 2 Wrong : 0

At 45°N, wind is blowing northward and its magnitude decreases eastward from 10 m s^{-1} to 1 m s^{-1} over a distance of 18 km. The absolute vorticity of the flow is _____ $\times 10^{-4}$ s^{-1}.

[Angular velocity of the Earth: 7.27×10^{-5} rad s^{-1}]

Question Number : 158 Correct : 2 Wrong : 0

Sea surface height anomalies at the locations A, B, C and D are -10, -15, 5 and 0 cm respectively.



The magnitude of geostrophic velocity at P is _____ m s^{-1}.
[Take 1° = 100 km, g = 10 m s^{-2}, Angular velocity of the Earth: 7.27×10^{-5} rad s^{-1}]

Question Number : 159 Correct : 2 Wrong : 0

In a severe tropical cyclone, 250 mm of rainfall occurs in an area having a radius of 200 km. If the energy supplied to the system from this rainfall is N times the energy of one atomic bomb ($=1.5\times 10^{15}$ kJ), then the value of N is _____.

[Density of freshwater: 1000 kg m^{-3}, Specific heat of seawater: 4200 J kg^{-1} K^{-1}, Latent heat of evaporation: 2.45×10^{6} J kg^{-1}]

Question Number : 160 Correct : 2 Wrong : -0.66

A student wants to numerically solve the linear 1-D advection equation $\frac{\partial \varphi}{\partial t} + c\frac{\partial \varphi}{\partial x} = 0$, where $c = 300$ m s^{-1}. The value of the maximum time-step the student can consider according to CFL criterion for a spatial resolution of 3 km is

(A) 15 s (B) 10 s (C) 25 s (D) 20 s

Question Number : 161 Correct : 2 Wrong : -0.66

Planets in the solar system are in radiative equilibrium. Let S_0, α, T_0 and R denote solar constant, albedo, average temperature and radius of a planet, respectively, and σ is Stefan's constant. Then the energy balance of this planet is given by the expression

(A) $(1-\alpha)\, S_0 = 4\,\sigma\, T_0^4$

(B) $(1-\alpha)\, S_0 = 2\,\sigma\, T_0^4$

(C) $\alpha\, S_0 = \sigma\, T_0^4$

(D) $\pi\, R^2\, (1-\alpha)\, S_0 = 4\,\sigma\, T_0^4$

Question Number : 162 Correct : 2 Wrong : 0

A cumulonimbus cloud forms by an air parcel rising from the sea level with an initial temperature and specific humidity of 27°C and 20 gm kg^{-1}, respectively. Assume that moist static energy is conserved in this cloud. Then the cloud temperature at an altitude of 15 km is _____ K.

[Specific heat of dry air at constant pressure: 1005 J kg^{-1} K^{-1}, Specific heat of water vapour at constant pressure: 1850 J kg^{-1} K^{-1}, g = 10 m s^{-2}, Latent heat of evaporation: 2.45×10^6 J kg^{-1}]

Question Number : 163 Correct : 2 Wrong : -0.66

If u_g and v_g are respectively zonal and meridional components of a flow field in geostrophic balance, then the divergence of this flow is

(A) 0

(B) $\frac{u_g}{f}\frac{\partial f}{\partial x}$

(C) $-\frac{1}{\rho f}\frac{\partial^2 p}{\partial y^2}$

(D) $-\frac{v_g}{f}\frac{\partial f}{\partial y}$

[x, y, f, p, ρ are zonal distance, meridional distance, Coriolis parameter, pressure and density, respectively]

Question Number : 164 Correct : 2 Wrong : -0.66

During the Indian summer monsoon season, depressions do not intensify to tropical cyclones because

P: Indian sub-continent is very hot and large land-sea temperature difference pulls depressions quickly to land before they can intensify into cyclones.
Q: southwesterly winds at low level are not conducive for the formation of tropical cyclones.
R: SST cooling due to strong monsoonal winds prevents cyclone formation.
S: strong zonal wind shear during the monsoon season does not allow warm core formation.

Which of the above statement(s) is(are) correct

(A) **P** & **Q**

(B) Only **R**

(C) Only **S**

(D) **R** & **S**

Question Number : 165 **Correct : 2 Wrong : -0.66**

Which among the following statement(s) is (are) correct,

P: ENSO and El-Nino are the same and refer to the warming of Equatorial Eastern Pacific SST.
Q: ENSO is an atmosphere-ocean coupled phenomenon and El-Nino is its oceanic part.
R: ENSO is an atmospheric phenomenon and El-Nino is an oceanic phenomenon
S: ENSO is the oscillatory component of El-Nino having a period of 4.7 years.

(A) **P** & **R** (B) Only **Q** (C) **P**, **Q** and **S** (D) **R** & **S**

General Aptitude

Question Number : 166 **Correct : 1 Wrong : -0.33**

The event would have been successful if you _____ able to come.

(A) are (B) had been (C) have been (D) would have been

Question Number : 167 **Correct : 1 Wrong : -0.33**

There was no doubt that their work was <u>thorough</u>.

Which of the words below is closest in meaning to the underlined word above?

(A) pretty (B) complete (C) sloppy (D) haphazard

Question Number : 168 Correct : 1 Wrong : -0.33

Four cards lie on a table. Each card has a number printed on one side and a colour on the other. The faces visible on the cards are 2, 3, red, and blue.

Proposition: If a card has an even value on one side, then its opposite face is red.

The cards which MUST be turned over to verify the above proposition are

(A) 2, red (B) 2, 3, red (C) 2, blue (D) 2, red, blue

Question Number : 169 Correct : 1 Wrong : -0.33

What is the value of x when $81 \times \left(\frac{16}{25}\right)^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144$?

(A) 1 (B) -1 (C) -2 (D) Cannot be determined

Question Number : 170 Correct : 1 Wrong : -0.33

Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the top faces of the dice is a perfect square is

(A) 1/9 (B) 2/9 (C) 1/3 (D) 4/9

Question Number : 171 Correct : 2 Wrong : -0.66

Bhaichung was observing the pattern of people entering and leaving a car service centre. There was a single window where customers were being served. He saw that people inevitably came out of the centre in the order that they went in. However, the time they spent inside seemed to vary a lot: some people came out in a matter of minutes while for others it took much longer.

From this, what can one conclude?

(A) The centre operates on a first-come-first-served basis, but with variable service times, depending on specific customer needs.
(B) Customers were served in an arbitrary order, since they took varying amounts of time for service completion in the centre.
(C) Since some people came out within a few minutes of entering the centre, the system is likely to operate on a last-come-first-served basis.
(D) Entering the centre early ensured that one would have shorter service times and most people attempted to do this.

Question Number : 172 **Correct : 2 Wrong : -0.66**

A map shows the elevations of Darjeeling, Gangtok, Kalimpong, Pelling, and Siliguri. Kalimpong is at a lower elevation than Gangtok. Pelling is at a lower elevation than Gangtok. Pelling is at a higher elevation than Siliguri. Darjeeling is at a higher elevation than Gangtok.

Which of the following statements can be inferred from the paragraph above?

i. Pelling is at a higher elevation than Kalimpong
ii. Kalimpong is at a lower elevation than Darjeeling
iii. Kalimpong is at a higher elevation than Siliguri
iv. Siliguri is at a lower elevation than Gangtok

(A) Only ii (B) Only ii and iii (C) Only ii and iv (D) Only iii and iv

Question Number : 173 **Correct : 2 Wrong : -0.66**

P, Q, R, S, T and U are seated around a circular table. R is seated two places to the right of Q. P is seated three places to the left of R. S is seated opposite U. If P and U now switch seats, which of the following must necessarily be true?

(A) P is immediately to the right of R
(B) T is immediately to the left of P
(C) T is immediately to the left of P or P is immediately to the right of Q
(D) U is immediately to the right of R or P is immediately to the left of T

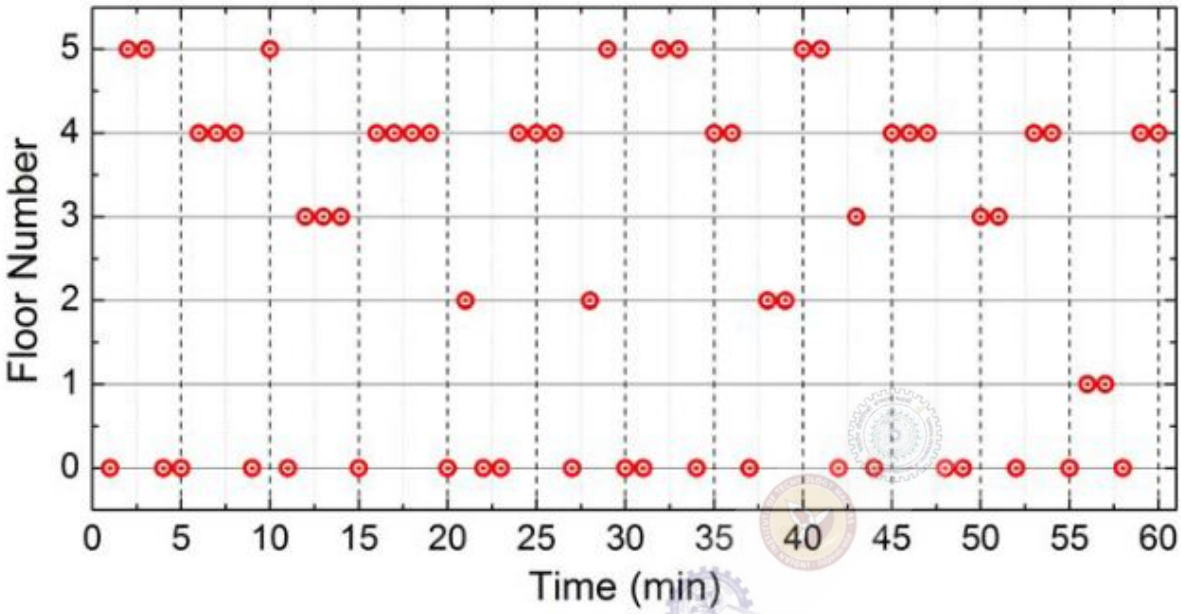
Question Number : 174 **Correct : 2 Wrong : -0.66**

Budhan covers a distance of 19 km in 2 hours by cycling one fourth of the time and walking the rest. The next day he cycles (at the same speed as before) for half the time and walks the rest (at the same speed as before) and covers 26 km in 2 hours. The speed in km/h at which Budhan walks is

(A) 1 (B) 4 (C) 5 (D) 6

Question Number : 175 **Correct : 2 Wrong : -0.66**

The points in the graph below represent the halts of a lift for durations of 1 minute, over a period of 1 hour.



Which of the following statements are correct?

i. The elevator never moves directly from any non-ground floor to another non-ground floor over the one hour period

ii. The elevator stays on the fourth floor for the longest duration over the one hour period

(A)) Only i (B) Only ii (C) Both i and ii (D) Neither i nor ii

Q. No.	Type	Section	Key	Marks
1	NAT	XE-A	2.98 to 3.02	1
2	MCQ	XE-A	D	1
3	NAT	XE-A	6.98 to 7.02	1
4	NAT	XE-A	2.98 to 3.02	1
5	MCQ	XE-A	C	1
6	NAT	XE-A	7.98 to 8.02	1
7	MCQ	XE-A	C	1
8	MCQ	XE-A	A	2
9	NAT	XE-A	0.98 to 1.02	2
10	NAT	XE-A	-0.02 to 0.02	2
11	MCQ	XE-A	C	2
12	MCQ	XE-B	B	1
13	MCQ	XE-B	B	1
14	MCQ	XE-B	C	1
15	MCQ	XE-B	A	1
16	MCQ	XE-B	D	1
17	MCQ	XE-B	D	1
18	MCQ	XE-B	A	1
19	NAT	XE-B	22.6 to 22.6	1
20	MCQ	XE-B	A	1
21	NAT	XE-B	72.5 to 75.0	2
22	NAT	XE-B	62 to 66	2
23	MCQ	XE-B	D	2
24	MCQ	XE-B	C	2
25	NAT	XE-B	0.66 to 0.67	2
26	NAT	XE-B	6005 to 6005	2
27	NAT	XE-B	0.05 to 0.06	2
28	MCQ	XE-B	D	2
29	NAT	XE-B	1.3 to 1.4	2
30	NAT	XE-B	28.9 to 31.4	2
31	NAT	XE-B	0.21 to 0.22	2
32	NAT	XE-B	7.0 to 7.2	2
33	MCQ	XE-B	B	2
34	MCQ	XE-C	B	1
35	MCQ	XE-C	D	1
36	MCQ	XE-C	C	1

37	MCQ	XE-C	B	1
38	MCQ	XE-C	A	1
39	MCQ	XE-C	C	1
40	MCQ	XE-C	D	1
41	MCQ	XE-C	B	1
42	MCQ	XE-C	D	1
43	NAT	XE-C	0.990 to 1.010	2
44	NAT	XE-C	53.0 to 53.2	2
45	MCQ	XE-C	A	2
46	MCQ	XE-C	A	2
47	NAT	XE-C	7.5 to 7.7	2
48	NAT	XE-C	37.5 to 38.5	2
49	MCQ	XE-C	B	2
50	NAT	XE-C	7.50 to 7.80	2
51	NAT	XE-C	172 to 174	2
52	MCQ	XE-C	D	2
53	NAT	XE-C	1.35 to 1.37	2
54	MCQ	XE-C	C	2
55	MCQ	XE-C	A	2
56	NAT	XE-D	69 to 73	1
57	MCQ	XE-D	B	1
58	MCQ	XE-D	C	1
59	MCQ	XE-D	C	1
60	MCQ	XE-D	A	1
61	MCQ	XE-D	B	1
62	MCQ	XE-D	A	1
63	NAT	XE-D	0.26 to 0.28	1
64	MCQ	XE-D	A	1
65	MCQ	XE-D	D	2
66	NAT	XE-D	134 to 136	2
67	NAT	XE-D	0.55 to 0.65	2
68	NAT	XE-D	1785 to 1792	2
69	NAT	XE-D	0.45 to 0.50	2
70	NAT	XE-D	32 to 35	2
71	NAT	XE-D	10 to 10	2
72	NAT	XE-D	02 to 02	2
73	MCQ	XE-D	A	2

74	NAT	XE-D	17 to 18	2
75	MCQ	XE-D	C	2
76	MCQ	XE-D	B	2
77	MCQ	XE-D	B	2
78	MCQ	XE-E	B	1
79	MCQ	XE-E	C	1
80	MCQ	XE-E	C	1
81	NAT	XE-E	0.17 to 0.18	1
82	MCQ	XE-E	B	1
83	MCQ	XE-E	D	1
84	MCQ	XE-E	A	1
85	MCQ	XE-E	B	1
86	NAT	XE-E	499 to 501	1
87	NAT	XE-E	53 to 55	2
88	MCQ	XE-E	D	2
89	NAT	XE-E	0.026 to 0.030	2
90	NAT	XE-E	73.5 to 73.8	2
91	NAT	XE-E	2.2 to 2.2	2
92	NAT	XE-E	0.140 to 0.150	2
93	MCQ	XE-E	C	2
94	MCQ	XE-E	A	2
95	MCQ	XE-E	A	2
96	NAT	XE-E	2225 to 2230	2
97	NAT	XE-E	0.76 to 0.82	2
98	NAT	XE-E	29.0 to 30.0	2
99	NAT	XE-E	60.5 to 61.5	2
100	MCQ	XE-F	D	1
101	MCQ	XE-F	B	1
102	MCQ	XE-F	A	1
103	MCQ	XE-F	C	1
104	MCQ	XE-F	A	1
105	MCQ	XE-F	D	1
106	MCQ	XE-F	C	1
107	MCQ	XE-F	D	1
108	MCQ	XE-F	A	1
109	MCQ	XE-F	B	2
110	MCQ	XE-F	C	2

111	NAT	XE-F	55.95 to 56.55	2
112	NAT	XE-F	1.14 to 1.24	2
113	MCQ	XE-F	C	2
114	NAT	XE-F	410 to 418	2
115	MCQ	XE-F	B	2
116	MCQ	XE-F	A	2
117	NAT	XE-F	98.5 to 99.5	2
118	NAT	XE-F	41.00 to 42.20	2
119	MCQ	XE-F	D	2
120	NAT	XE-F	-67.3 to -66.3	2
121	MCQ	XE-F	B	2
122	MCQ	XE-G	B	1
123	MCQ	XE-G	B	1
124	MCQ	XE-G	D	1
125	MCQ	XE-G	B	1
126	NAT	XE-G	1000 to 1000	1
127	MCQ	XE-G	A	1
128	NAT	XE-G	2078 to 2086	1
129	NAT	XE-G	0.80 to 0.90	1
130	MCQ	XE-G	A	1
131	MCQ	XE-G	C	2
132	MCQ	XE-G	B	2
133	MCQ	XE-G	D	2
134	NAT	XE-G	25550 to 25650	2
135	MCQ	XE-G	D	2
136	NAT	XE-G	53.30 to 55.25	2
137	NAT	XE-G	64.0 to 64.0	2
138	NAT	XE-G	0.14 to 0.18	2
139	MCQ	XE-G	D	2
140	NAT	XE-G	6.80 to 7.20	2
141	NAT	XE-G	10.80 to 11.20	2
142	NAT	XE-G	9000 to 9000	2
143	NAT	XE-G	0.30 to 0.40	2
144	MCQ	XE-H	B	1
145	MCQ	XE-H	C	1
146	NAT	XE-H	98.9 to 100.5	1
147	MCQ	XE-H	D	1

148	MCQ	XE-H	B	1
149	MCQ	XE-H	D	1
150	MCQ	XE-H	C	1
151	MCQ	XE-H	A	1
152	MCQ	XE-H	B	1
153	NAT	XE-H	22.05 to 22.15	2
154	NAT	XE-H	0.59 to 0.61	2
155	NAT	XE-H	286.55 to 287.55	2
156	MCQ	XE-H	C	2
157	NAT	XE-H	-4.10 to -3.90	2
158	NAT	XE-H	0.42 to 0.46	2
159	NAT	XE-H	51 to 52	2
160	MCQ	XE-H	B	2
161	MCQ	XE-H	A	2
162	NAT	XE-H	199 to 205	2
163	MCQ	XE-H	D	2
164	MCQ	XE-H	C	2
165	MCQ	XE-H	B	2
166	MCQ	GA	B	1
167	MCQ	GA	B	1
168	MCQ	GA	C	1
169	MCQ	GA	B	1
170	MCQ	GA	B	1
171	MCQ	GA	A	2
172	MCQ	GA	C	2
173	MCQ	GA	C	2
174	MCQ	GA	D	2
175	MCQ	GA	D	2